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New Year Poem Party at Court.

At the Imperial Court, Tokyo, a New Year Poem Party is held every year in the month of January. It is of course strictly a genuine Japanese function handed down from time immemorial. All Japanese subjects of poetical inclination are invited to present their efforts on the theme previously announced, and such as are pronounced the best are selected for the Imperial perusal and the subsequent publication. Customarily, T. I. M. the Emperor and the Empress with Princes and Princesses of the Blood take part in the event.

This year's theme is "Dawn at the Shrine," our humble effort on which theme with the particular qualification of "New Year's Dawn at the Meiji Shrine" (consecrated to the revered memory of H. late M. Meiji Tenno) is given on Page 1.

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New Year's Dawn at the Shrine.

The last night's shadows of the year parting
Are gently rolling away to give room
To the first flush of the dawn succeeding,
Which dissipates the deep, oppressive gloom.

Lo! Out of the sable blank void slowly
The rows of tall firs the approach lining
To th' holy shrine are looming up faintly
In a hushed silence awe inspiring.

As the morning gleam spreads itself farther
Up at the grav'lled road end is distinct
The new shrine gate of the Empire's Father
Crowned with dim glimpses of th' Inner Precinct.

Anon, the glorious sunrise has gilded
The edges of the whole ground consecrated.
The birds have begun singing strains of hymns
In tune with prayers of early pilgrims.

Mighty was the Sovereign canonized,
Who raised our land from total oblivion
To a nation of the highest station
By the Powers of the world recognized.

In course of less than half a century
The mourned Great Leader transformed our country.
It was the most brilliant, peerless reign——
Th' dearest pride and treasure of the Domain.

By Mr. Z. Hamamura.

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MANCHURIA & MONGOLIA TO BE THROWN OPEN.

To International Exploitation.

By Mr. Tetsuo Ishikawa.

The United States and Japan were brought to terms last Summer as regards the organization of the new Consortium for China after passing through a chain of stages since the proposition was first raised by the United States in June, 1918. The new understanding thus formed was duly endorsed by both Great Britain and France, and so the concord of the Four Powers on this subject was completely established. On May 11, 1920, the compact regarding the formation of the new financing group is said to have been signed between Mr. Thomas Lamont (Representative of the American Banking Syndicate) and Mr. Kajiwara representing the Japanese Banking Syndicate, to serve as a foundation for the establishment of the same group.

On May 12, the Foreign Office, Tokyo, published the origin and progress of negotiations regarding the proposition, along with its hopes for the future. On the previous evening (May 11, 1920), on which a farewell dinner was given Mr. Lamont, speeches were made by Mr. J. Inouye (President of the Nippon Ginko, Bank of Japan) and the guest of honour. The nature of the new Consortium was enunciated more clearly in toast and response. From these speeches, what an amount of pains was taken by the authorities concerned and how the mutual understanding came to be blended into harmony may be truly appreciated.

Similar conferences have been carried on since between the British, French, and Japanese bankers, and after consulting the wishes of the Chinese Government, the actual organization of the Consortium is to be proceeded with, although, as a matter of fact, it may be said that this very scheme came within range of logical practicality as the American and Japanese Representatives arrived at agreement, as observed at the opening of this article.

The aim of the new group, as declared by Mr. Lamont, is firstly to assist China in developing her important enterprises of public interest, secondly thus to consolidate China's economic foundation, and at the same time to make China an open market for international trade, thirdly to stimulate individual enterprises, and fourthly to make the Powers co-operate to their common ends so as to bring them

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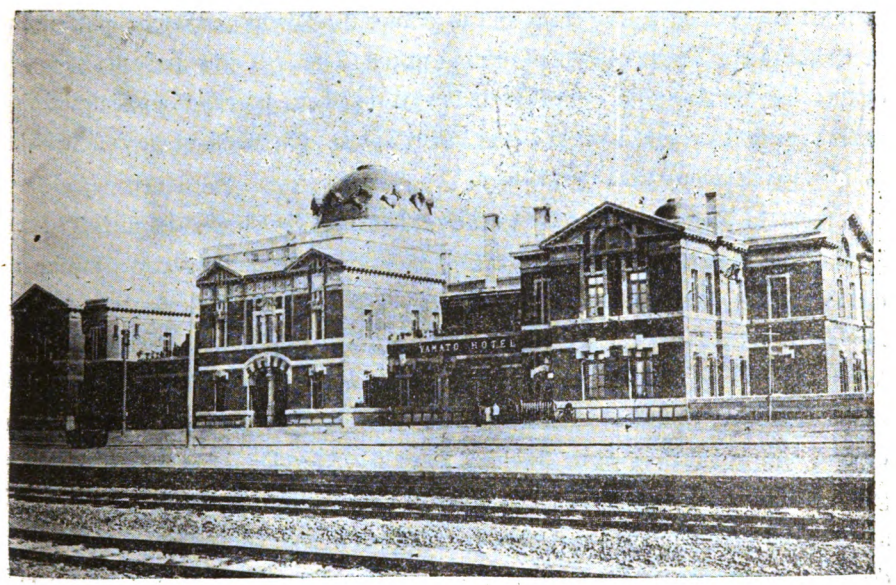
into still closer relation with China, which will prove conducive to safeguard the peace of the Orient and perhaps the world.

All these objects had been endorsed by the Japanese, who of course found nothing therein to object to in principle.

What claims our attention is firstly the withdrawal of Japan's demand to exclude Manchuria and Mongolia from the sphere of intended operation of the new Group, and secondly the misgivings of the Chinese concerning the new Consortium owing to their opposition to the power to supervise China's finances, which the new Group is to acquire in time. As far as the latter point is concerned, China, in her present financial strait, ought to be awake to the urgent need to readjust her finances at the earliest possible date, and this point, in its very nature, needs



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no elucidation. Therefore we shall devote our attention in the present article to the former point, namely, the issue concerning Manchuria and Mongolia.

The story of the proposed exclusion of Manchuria and Mongolia from the sphere of operation of the new Consortium is quite complex, to say the least. The proposition brought up by the United States Government in 1918 was debated upon at Paris by the representatives of the Four Powers—Great Britain, France,

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the United States, and Japan—on May 11 and 12, 1919. At this meeting, the American proposition was approved of on general lines, and it was agreed to obtain the definite consent of the respective Home Governments and banking syndicates. For Japan's part, she agreed to join the Consortium on condition that Manchuria and Mongolia be excluded, lest the economic activity of the new Group might conflict with Japan's acquired concessions.

Towards the end of 1919, the American Banking Syndicate transmitted its objection to the Japanese syndicate, and this brought the realization of the scheme to a standstill for a time.

China's frenzied finances and her industrial depression, coupled with the tendency among the capitalists of the Four Powers to act independently, threatened to hatch competition among them and to disrupt the Powers' economic influences in China to the hindrance of the opening up of China. It was perhaps because of this that the American capitalists intimated to their Japanese associates their willingness to discuss the issue in a conciliatory spirit. Exchanges of views followed, in which concessions were reciprocated.

Early in March, 1920, the American Banking Syndicate despatched Mr. Lamont (of Messrs. J. P. Morgan & Co.) to Japan to confer with the Japanese concerning the formation of the new Group. The Japanese side was represented by Mr. J. Inouye (President of the Bank of Japan), Mr. Kajiwara (President of the Yokohama Specie Bank), etc. Notes were compared unreservedly, and what misunderstanding there had existed between the bankers of the two countries was cleared, and negotiations made headway about the formation of a new financing group aiming at the economic exploitation of China. The Japanese Government saw that, to persist in the exclusion of Manchuria and Mongolia, would only deepen the suspicion of the Powers as to Japan's true motive, and was persuaded to concede a few points, and thus, upon reaching a good understanding with the American Banking Syndicate, it signified its readiness to approve of the desired participation of the Japanese Banking Syndicate in the new Group.

As regards the so called exclusion of South Manchuria and Inner Mongolia, the term is quite vague.

Some aver that it means to exclude all loans, past and future, from the control of the new Consortium; whilst others interpret it as the reservation of Japan's

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claims so long as her responsibility is met. Either interpretation seems burdened with ambiguity.

The statement made by Japanese Minister Obata to Peking to the Peking correspondent of the *Japan Advertizer* on February 14, 1920, may be accepted as a reliable rendering of a view held by Japan's diplomatic representative. The purport of the so called "exclusion," according to the Japanese Minister, may be incorporated in the following:—

"(a) People other than conversant with the issue seem ready to jump to the conclusion that Japan has demanded to exclude Manchuria and Mongolia from the scope of operation of the new financing group as proposed by the United States. In fact, South Manchuria and the eastern part of Inner Mongolia were the only districts, the exclusion of which was demanded.

"(b) All that Japan demanded was to exclude the existing loan agreements in those regions, and she did not mean to protest to any fresh investments to be made in the same regions in the future.

"(c) Japan is, however, unlikely to pass over any intention of another Power menacing the security of the frontiers.

Then, the Japanese Minister went on to add:—

From the above Japan's stand may be summed up as follows:

The exclusion of all past loan agreements in South Manchuria and the eastern part of Inner Mongolia was desired, and all loans incompatible with Japan's national defences were demanded to be also excluded.

Compared with the rumours then in circulation, the essential difference lies in leaving all future loans to the new financing group excepting such as are deemed strategically prejudicial to Japan.

The above interpretation has been regarded in some quarter as a misunderstanding of Japan's true intentions, but, in truth, the Japanese Government is believed to have presented its demand to an approximately similar effect.

Then, Japan's demand encountered a setback from America, and was also looked at askance by the other Powers concerned. After all, Japan felt constrained to show due respect to America's wish and also to disarm the other Powers of their suspicion. Her attitude was practically decided at the extraordinary Cabinet meeting held on March 28, 1920, and also by the Diplomatic Council, which met on the

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following day. A concession in Japan's stand was agreed upon principally on strategic lines, and is said to have assumed the following shape :—

(1) No railway line parallel to the South Manchuria Railway shall be projected by the new financing group.

(2) If the new group should be taken up with business enterprises, delaying the opening-up of Manchuria and Mongolia compared with the other parts of China, Japan shall reserve the right to make an investment single-handedly and to manage the enterprise.

(3) Whatever is indispensable from the consideration of strategy and national defences shall be reserved by Japan absolutely.

For the rest, Japan is reported to have decided to leave to the new financing group most of the undertakings not yet taken up, so far as it does not trespass upon the fundamental principle to maintain Japan's acquired rights, gladly offering a reasonable concession in a measure consistent with the national defences.

Mr Lamont, on his way back from China, visited Japan for the second time for a further exchange of views with eminent personages in the government and out thereof. As a result, the reservation of Japan's acquired rights in Manchuria and Mongolia was included in the agreement as part of the amendment, and thus a complete understanding was established at last between the United States and Japan. On May 6, 1920, both Great Britain and France gave their consent, and this was followed with the signing of the agreement on the ensuing 12th as above mentioned.

Rumour says that the above amendment consists of the waiving of Japan's preferential claims regarding the laying of a railway between Taonanfu and Jehol, and also the undertaking not to extend the proposed Chengchiatun-Kailu line further west of Kailu.

On the surface of it, Japan may appear to have reserved everything in the districts in question, but on closer inspection, she has seemingly renounced her claims in Eastern Mongolia, particularly west of Jehol.

At the same time, a sort of understanding seems to have been practically established not to finance any projected railway competing with the South Manchuria Railway like the Chinchow (near Shanhaikwan)—Aigun line scheme sponsored years ago by Mr. Willard D. Straight of the United States, and further not to menace

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the special political position Japan already occupies, even though no reference is made at all to political matters, in the new agreement.

Thus, this knotty problem was smoothly solved, thanks to the mutual concession.

Since the Japanese Government seconded the new Consortium scheme at Paris in principle, a cry of dissatisfaction was raised in part of the military quarter and businessmen as well. This antagonism had the effect of altering the Government's front. It pleaded the difficulty to open South Manchuria and Inner Mongolia to international exploitation, economically and much more politically, because of Japan's special interests therein. Upon this difficulty was based the desired exclusion of these regions, upon which Japan's participation in the new group was conditional. Thus, a deadlock was introduced in the organization of the new Consortium for China, and at a time Japan seemed even inclined to stand aloof of the new compact unless her condition be accepted.

In weighing the actual merit of this point at issue, it would be interesting to study the intrinsic value of the regions mentioned, and their relation to the new Group from both political and economic points of view.

Economic Value of Manchuria and Mongolia and Their Relation to New Compact.

We have triple reason for saying that Japan will lose nothing economically by throwing open Manchuria and Mongolia.

Firstly, the wealth of natural resources; secondly, Japan's influence pretty well rooted therein; and thirdly, Japan's favourable geographical position.

The abundance of natural resources in the vast plains of Manchuria and Mongolia hardly need an idle reiteration here. Speaking of agricultural wealth, Manchuria holds 32,510,400,000 *tsubo* or 26,868,099 acres of land under cultivation, and the eastern part of Inner Mongolia 7,692,000,000 *tsubo* or 6,357,025 acres. The unreclaimed land suitable for cultivation is estimated at roughly 1,080,000,000,000 *tsubo* or 24,793,388 acres. In Heilungkiang Province, the land area awaiting reclamation is put at 80% of the whole arable land. The wilderness in Manchuria and Mongolia is being reclaimed annually to the extent of between 900,000,000 *tsubo* or 20,661 acres) and 1,200,000,000 *tsubo* (or 27,548 acres).

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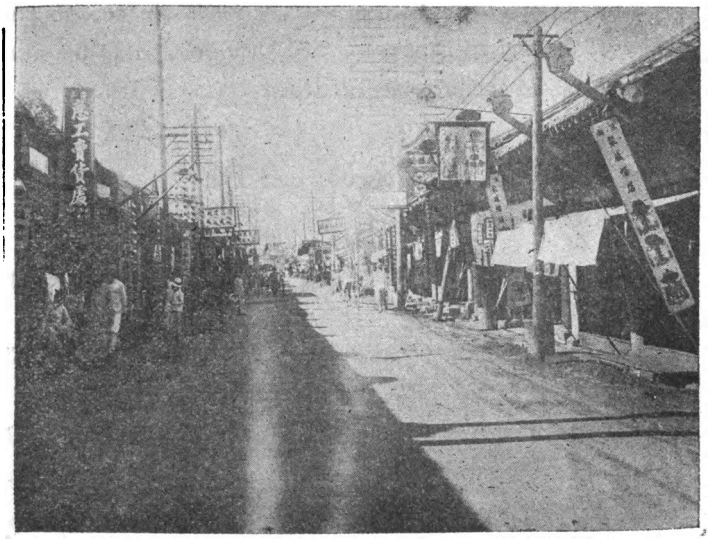
The average density of population in Manchuria and Mongolia is only 328 people per square *ri* (one Japanese *ri* being almost equal to 2½ miles).

Manchuria and Mongolia are bounteously endowed for cattle-raising and sylviculture, and with marine products, not to mention agricultural produce, for which the fecundity of the soil is remarkable. They indeed hold out a capital promise as supplier of raw materials. The extent of these natural resources is really so vast as to throw out of the question their effective tapping by the Japanese people single-handedly.

Turning to the Japanese economic assets in these regions, the different companies at the end of March, 1920, totalled 4,032 with the aggregate subscribed capital of ¥1,344,292,048, of which ¥478,057,400 was paid up. Allowances should be made in the above total for the fact that the capital amounts of the Yokohama Specie Bank, the Mitsui Bussan Kaisha, the Mitsubishi, etc., which rank among the foremost business corporations in Japan and keep branches in South Manchuria, are included in the same. It may, therefore, be added that all the above figures are not invested in these parts. Still, since the above do not include the individual investments, the actual sum invested may safely be put somewhere about ¥3,000,000,000, which indicates how well-rooted are the Japanese economic interests in Manchuria and Mongolia.



STREET SCENE IN CHINESE CITY OF MUKDEN.

Then it would be almost a flagrant insult to the intelligence of the new financing group to even imagine that, for no other purpose than the eradication of the Japanese vested interests in Manchuria and Mongolia, the group would invest so immensely in

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these parts as to go to the length of paying a heavy sacrifice. Again, it might be held as quite impracticable, not to say absolutely incongruous, for the same group to wedge itself into a territory, in which Japan's economic influence predominates, remembering the fundamental aim of the group to invest in China in harmonious concert.

Thirdly, Japan is geographically contiguous to Manchuria, etc., which attract immigrants. On October 1st, 1920, on which date the first national census in the history of Japan was taken, the Japanese population under the jurisdiction of the Kwantung Government (inclusive of the Kwantung Leased Territory, the South Manchuria Railway Area, and the districts under the Japanese Consulates) numbered altogether 170,572, not including 16,014 Koreans. (As regards the Japanese, 78,978 were in the Kwantung Leased Territory, 71,497 in the South Manchuria Railway Area outside the Leased Territory, and 2,098 under the Consular jurisdiction outside the Railway Area) (the Chinese being excluded). It would be idle to suppose that a tide of immigration of Europeans and Americans would ever flow into Manchuria.

The Japanese will continue to enjoy their facility to settle freely in Manchuria, etc.

All misgiving that may oppress some of the enterprising Japanese interested in the work of colonization as to the role, as it were, assigned by destiny to the Japanese for economic activity in Manchuria, etc., seems ill-grounded.

Political Value of Manchuria and Mongolia and their Relation to New Consortium.

Politically speaking, the opening of Manchuria and Mongolia to international tapping will not in the least impair the validity of the special rights secured by Japan in terms of the Sino-Japanese Treaty of 1915. Nor can it mean in any sense Japan's renunciation even in part of the Ishii-Lansing Protocol recognizing Japan's special position in the land contiguous to Japan.

The cardinal reason for holding the administrative power in part of Manchuria, etc., was the highest strategic considerations brought up by China's inability to withstand Russia's aggression in the past. Russia having fallen into a state of anarchy, nobody can tell how soon she will be able to lift her head again. Supposing that Japan's special rights should ever be menaced, all that she need to do would be to stand by her legitimate rights on the strength of all the treaties, conventions, and agreements endorsing Japan's special position.

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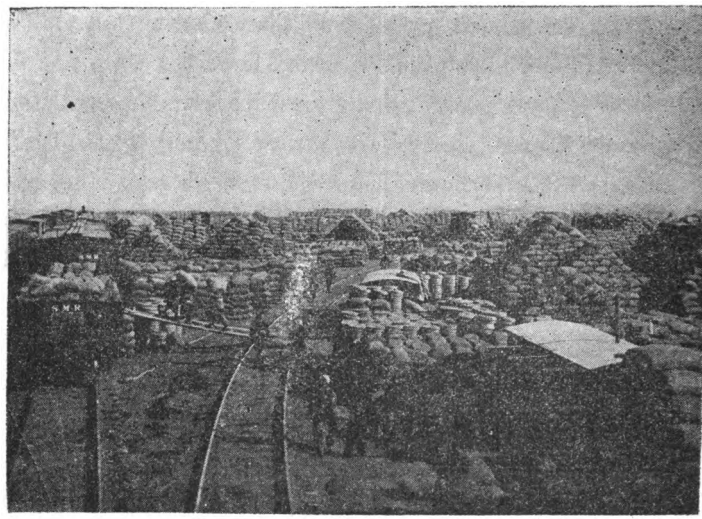
From both political and economic standpoints, the question of keeping aloof of the new financing group in order to reserve Manchuria and Mongolia for Japan's exploitation would not hold water, if only seen from an impartial angle. Moreover, any such false step, if taken, would chain down Japan's diplomacy to a grovelling level characterized with an insular narrow-mindedness. The proposed exclusion of Manchuria and Mongolia has yet no place in any of the existing international compacts between China and Japan. Secretary Knox's proposal to neutralize the Manchurian Railways met with Japan's protest conjointly with Russia. China had nothing to do with it. It might be noted that the three Governments of Great Britain, France, and the United States, in view of the contiguity of Manchuria and Mongolia to Japan, appreciated Japan's express wish to have her national defences and also the economic existence of her people adequately guaranteed, and, far from intending to take any step inimical to Japan's essential interests, are said to have declared that they were prepared to give a general guarantee for the protection of Japan's interests.



MOUNTAINS OF BEANS IN CHANGCHUN STATION YARD.

There is still some opposition against Japan's joining the new Consortium, all converging into the one point that the concession given away was excessive. Some object to the renunciation of the Toananfu-Jehol Line on the ground that, out of the five railways in project in South Manchuria and Inner Mongolia, the building concessions for which are held by Japan, the Taonanfu-Jehol Line cannot be placed on a like plane to the others from the dual point of view, strategic and political. To sign away this line under the captivating term of mutual concession, is construed by some

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as nullifying the reservation of Japan's acquired rights. Others find fault with Japan's failure to secure an express guarantee, regarding her claims in Manchuria and Mongolia, from the Triple Powers of Great Britain, France, and the United States, being contented with only an understanding with them to recognize Japan's acquired rights, and also her future position in Manchuria and Mongolia. They say that both Great Britain and the United States are made out to have each produced extensive interests held by themselves, but they are, strictly speaking, only hollow, empty ones, the contribution of which is believed to be felt by the Powers concerned very slightly, if any at all. Japan's faint hearted diplomacy bodes ill, indeed.

However, any such line of argument is held as worthy of the old aggressive element of Japan. In other words, it is built upon a concession-hunt fever ever ready to give a political and strategic colour to everything either exaggeratedly or when utterly unwarranted. Any one once having set foot in Manchuria and Mongolia will clearly understand that the Taonanfu-Jehol Line in question has no direct serious concern with the strategic or political Japan. To try to associate the same line in project with anything of strategic or political importance to Japan might reflect unfavourably upon the party who may stoop to it.

Let us now look at the issue from an economic standpoint.

Since Great Britain, France, and the United States have each contributed some of her own acquired concessions to the new financing group, the sacrifice is common.

In order to carry out the desired opening-up of Manchuria and Mongolia on an effective scale, the earlier the proposed railways are laid, the better for the economic welfare of all. From this consideration, any opportunity to avail of the ample capital the new Consortium will furnish ought to be heartily welcomed in preference to the patient waiting for one rather ill-funded nation to come forward to finance the railway in project in a niggardly manner. Any nation that should fail to grasp the superb significance of such a fair and wise attitude would deserve an elimination from the international race of progress.

China is now casting off her old garment of ignorance and perversity, and the Powers' relations to her are growing more complicated. Therefore, it behoves Japan to deport herself in such way as to always enlist the Powers' approbation.

Mr. Bronson Rea (Proprietor of the *Far Eastern Review* and American journalist, once said:—

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Japans' privileges in Inner Mongolia and Manchuria constitute a direct menace to Peking. Why Japan refuses to produce concessions in those quarters is proof patent of her aggressive design.

If the proposed organization of the new financing group had materialized at the outset, there would have certainly been little room left for any such misunderstanding.

An explanatory diplomacy of a passive nature has outlived its usefulness, and, although wise after the event, we ourselves might have served to advantage as the very sponsor of the new financing group. In order to keep Japan's sincerity of purpose clearly understood amidst the tangled complications of international issues, she must ever bear in mind the steadfast pursuance of a straightforward diplomacy of positive category.

At all events, the establishment of the new Consortium calls for congratulation at least from a dual consideration.

Firstly, it is a realization of the concert among the Powers. The West seem to be labouring under the wrong notion that Japan is a Germany of the Orient. It may be admitted that, among the few Japanese closely connected with the militarism, an aggressive policy is too often apt to be blindly accepted as a matter of course as indispensable to the rise of the nation's destiny.

That any such opinion does not reflect Japan's public opinion has been exemplified for once by her recent participation in the new financing movement.

Next, the improvement of the Sino-Japanese relations is not an issue between the two nations only, but is one which must be based upon the Powers' consent. Not a single opportunity should be suffered to be let slip by Japan to materialize the Powers' concert. It was a stroke of good fortune that an excellent opportunity was thus caught by the forelock by Japan. The substantially salutary effect of the hearty hand-shake of the United States and Japan over the exploiting of the economic China upon their mutual international relations may be easily imagined.

Secondly, it is a realization of the principle of equal opportunity. There would have been not a word to be said at all, if Japan had kept off the new Consortium. But once she supported the proposition in principle, it would have been decidedly foolish and stupid for her to higgle about a few railway concessions of a questionable economic value, seen from the viewpoint of international

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concert. Any such stupidity would have also furnished to the others an excuse to copy her example, and further would have excited needless dislike and even hatred.

It is true that Japan has lost someting in this deal, but it is this loss that has entitled her to a fair share in the economic gain expected from the opening-up of the more richly-endowed part of China. "Give and take" is the fairest and wisest principle of economy.

The establishment of the new consortium having in primary view the introduction of foreign capital, Manchuria and Mongolia claiming an early recognition, it cannot fail to exert a very favourable influence over their economic and cultural welfare. Then, the import of foreign capital in these times of dearth of funds should be doubly welcome.

So long as the South Manchuria Railway trunk lines remain under Japanese management, there is no denying the joint investments of the Powers in Manchuria and Mongolia furthering the Japanese interests, to say nothing about their being essential to the opening-up of those regions.

It will be thus seen that the formation of the new Consortium may be said to have marked a turning point in the activities of the Japanese in China.

Out of the aggregate foreign loans of China amounting to roughly ¥2,000,000,000, Japan's share reaches about Y400,000,000, only second to Great Britain. The development of the economic China following the import of foreign capital is bound to increase considerably the volume of Japan's trade and to expand the sphere of her industrial operation.

Besides, the Powers' concert in connection with the Consortium is definitely confined to the specified limits, all undertakings not concerning direct the Chinese Government or authorities being placed outside the pale of the new financing group. This leaves the Japanese to seek any likely openings for investment. It must be added that the relations between China and Japan do not involve merely interests or questions of gain and loss, but they have a vitally important bearing on their mutual sustenance, and are in fact absolutely inseparable. Therefore, there is ample room for the two nations to cooperate economically to their mutual benefit.

To give a resume of the above, as the first step to realize the cherished hope

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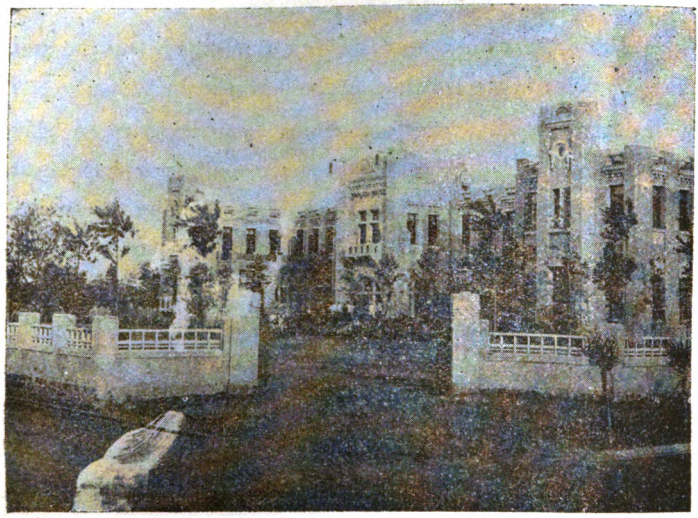
to see Manchuria and Mongolia thrown open, we take note of a serious significance in the establishment of the new Consortium. Manchuria and Mongolia are part of Chinese territory, and no outsider can transgress politically or economically upon either, unless sustained by some international agreement.

The proposal of Mr. John Hay (then Secretary of State of the United States) to keep the door of China open, as made in 1899, has become universally endorsed. This principle should be acceptable also to Manchuria and Mongolia, for in economic exploitation, nature, capital, and labour must needs join hands, and the opportunity to make most of the triple factor has now ripened.

As may be easily seen, what Manchuria wants is neither nature nor labour, but capital. The economic Manchuria seems ready to respond with alacrity to all intelligent tapping backed with large capital. The benefit accruing therefrom will be shared alike by China, Japan, Great Britain, the United States, France, etc., although the dimensions of their respective shares must necessarily vary. Some Japanese have long persisted in the wrong view that everything is losing unless monopolized. They would fain say to foreign capitalists to keep off. But any of such exclusionists may be likened to a person looking on Manchuria and Mongolia as his own conservatory, jealously nurturing a few pots of indifferent plants with a trivial outlay in the vast field of Manchuria, etc. He may prosper, but the success will be puerile. We are eager to see this vast country



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thrown open to international tapping and transformed into fertile fields. Those who are to enjoy the harvest will be the nationals who have invested;—China who holds sovereignty over these districts and Japan who operates the trunk railways, in addition to the other heavy investors. It would be the height of stupidity to try to monopolize a few petty interests, thereby provoking the Powers' bad feeling against Japan. The wisest course open is to receive a fair share in the benefit of tapping the immense possibilities of Manchuria, etc., in concert with the Powers.

The Japanese are charged with shortcomings. One of them is to be taken up even indiscreetly with petty gain lying under their noses, quite oblivious to the general situation. Another is want of discipline in reaping the fruits of their labours conjointly with other nationals. Not a few misunderstandings with the Americans and the Chinese may be traced to the same defects of the Japanese people. It is to be devoutly hoped that the present opportunity will be turned to most account by remedying the want of popular discipline and by throwing open Manchuria, etc., with their latent wealth in affirmation of Japan's open door policy in these parts.

KEYSTONE FOR SINO-JAPANESE AMITY.

Population Problem.

By Mr. Toshi Go.

Japan's population is annually increasing at the rate of roughly 600,000, not to speak of her already overcrowded density at home. The population issue is and will be an extremely serious one in Japan. But Japan has a very hard nut to crack over it. Any attempt at her territorial extension is absolutely out of the question in this new age. Neither can Japan look for an efficacious remedy from emigration, since Australia, Canada, and the United States have practically closed their doors against Japanese emigrants. A few visionary radicals suggest the communistic distribution of wealth in the country, but the very meagreness of Japan's natural resources throws any such dream out of range of practicality. All things taken into consideration, the only practical solutions must be found in Japan's economic policy.

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Economic Enfiltration.

It may be taken for granted that trade and industrial policy should be fundamentally based on peace, but in these times of strenuous competition, such policy is too often carried out in the form of economic aggression. The United States of America is a vast fertile and industrial nation with the immensity of her natural resources and the overflowing abundance of her manufactures after meeting her own domestic wants which are on a stupendous scale. Yet, she would stick at few scruples to take advantage of commercial aggression. Great Britain, the first maritime and colonial Power as she is, would be as ready to catch every opportunity for economic aggression. With such conspicuous examples set before Japan by her Seniors, Japan well might avail herself of any legitimate and practicable economic advantage within the reach, especially when her very destiny may be said to depend upon it.

New Schools of Ideas.

New schools of ideas are finding disciples among the Japanese people, especially men of business. One of them is to mould Japan's national policy on peace and liberal lines. As an echo to the cry raised against the Japanese by some Americans and Britishers, who criticized Japan as prone to Imperialism driven by militarism, the progressive element of the Japanese race raised the alarm against a possible eventuality of Japan's being splendidly isolated in the world politics. They are striving to undeceive the harsh foreign critics by making Japan adopt a broad trade and industrial policy founded on liberalism. Another of the new-fangled ideas is democracy, pure and simple. The idealistic dreamers belonging to the above school appear to be picturing to their mind the transformation of Japan into a Utopia of liberty and equality. Many of academic youth have become, as it were, fascinated by some such idea and seem to have swallowed it at a gulp without even knowing how to digest it.

Raw Material Question.

It goes without saying that in the pursuance of such trade and industrical policy as above mentioned, the acquisition of necessary raw materials and also markets for manufactures should be secured. At present these materials are obtained by Japan with comparative ease. However, it is quite doubtful how long further Japan will be

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allowed to enjoy such facility without serious encroachment. For, the countries which are doing Japan an excellent turn as suppliers will be at perfect liberty to either restrict or absolutely stop the export of even their surplus stocks upon any handy pretext.

Japan's Resources.

Perhaps no country of importance on the face of the earth is poorer than Japan as far as natural resources are concerned. She lacks in almost all principal materials, such as Wool, Cotton, Iron, Coal, etc., which are absolutely indispensable to any self-dependent country. As things are, Japan depends upon India and the United States for Cotton; upon Great Britain for Wool, and upon China for Iron and Coal.

In this connection, it is to be noted that those countries richly endowed by nature are situated at a decided advantage over the others less-favoured, inasmuch as the former are in a position to fashion their own economic policy. Both the United States and Great Britain could exercise without the least trammel this superior economic prerogative during the war time. Each restricted or prohibited the export of her raw materials or products as she saw fit on consulting her own interests.

At all events, the bare ugly truth that Japan is precariously situated with regard to raw materials must be faced squarely in the face.

In what direction should Japan turn for her needed materials? If neither the United States nor Great Britain could be relied upon for the necessary supply, the only source left available for Japan will be China.

Market Question.

Another important question to be considered anent the trade and industrial policy is the market problem. It may be reminded that the United States and most countries in Europe have raised a tariff barrier against Japanese goods. Even Great Britain, who was the staunchest free trade champion, might, Heaven knows how soon, doff her traditional free trade to put on the new protective raiment of Imperial Preference Policy, for which a vigorous campaign was started by Mr. Hughes, Premier of the Australian Commonwealth, while in his mother country toward the end of the late war. Thus, the West has ceased to be a dependable customer to Japan, at least for the present.

The only countries that promise possibilities for Japanese goods are in Asia. China, in particular, offers a wider market than all the other countries put together.

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It is, therefore, only natural that the United States and the European countries are all casting their longing eyes upon China as the finest outlet of their surplus products.

Conclusion.

It will be clear from the above that China to Japan is the only country that may serve the dual role as supplier of raw materials and buyer of manufactures. With China left out of consideration, Japan would be deprived of both supplier and buyer, which contingency could not fail to prove so disastrous as to menace Japan's very existence.

China's diplomacy has been hopelessly entangled by misunderstandings of all manners, and Japan's relation to China has been no exception. On account of the geographical proximity and close political, strategic, and economic relations existing between the two countries, more international questions with China naturally arise before Japan than for any other nation. It requires clear foresight and shrewd tact on Japan's part to cultivate and even improve her happy fraternal relations with China. The mere hollow "Sino-Japanese amity" is but an anachronism. As the keystone for building up the amity upon a lasting foundation, the author proposes an interdependent economic reciprocity of the two countries. In other words, the peculiar economic assets of both should be merged into an integral whole, to be exploited by each other to their mutual benefit. Raw materials should be unrestrictedly exported to Japan from China, whilst manufactures needed by China should be imported from Japan freely. The author avers that this economic recipocity must be effected willingly or, if necessary, unwillingly on China's part. For, what Japan sorely needs for her very existence is some such supplier of raw materials and buyer of manufactures as China alone under the sun can fill just such a part. On this question, Japan can have no alternative, unless she were contented to be effaced off the world map.

FLOUR MILLING IN MANCHURIA

PART II.

By Mr. I. Sanka.

A glimpse at the North Manchuria Flour Mill, Ltd., that is the only plant of the kind in North Manchuria under Japanese management, will give an idea of the flour milling industry in North Manchuria.

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This company was established at Harbin in August, 1913, on a capital of ¥500,000, with a branch office at Tokyo. Business was opened in November, 1913, and the Company has developed steadily since. The latest dividends distributed to the shareholders were as follow:—

	For			
1918	first half	15%	per annum.	
	latter half	10%	,,	
		15%	,,	special dividend
1919	first half	ordinary dividend 10%	,,	
		special dividend 15%	,,	
	latter half	ordinary dividend 10%	,,	
		special dividend 20%	,,	
1920	first half	ordinary dividend 10%	,,	
		special dividend 20%	,,	

With the favourable progress of the enterprise, the Company planned to build a new mill, and by April, 1919, the installation of machinery had been completed and the new factory was opened to operation on May 1. The actual producing capacity is said to be 700 barrels and the new plant is acquitting itself well. As above stated, the Company was decided to be amalgamated with the Manchuria Flour Mill, Ltd., Tiehling, at an extraordinary general meeting of the shareholders held in March, 1920.

According to an official of the Industrial Office of the S. M. R. Co. Local Administration Department, who returned from a visit to Harbin in October, the flour milling circle at Harbin received a severe blow from the withdrawal of the Japanese troops from Siberia, and that, of the mills under management of other than Harbin people, there were only two possessed by Military Inspector Chang-tsolin, that had not suspeneded work, all the rest being as good as shut down.

As to the quality of flour put out at the Russian mills at Harbin, the table of analysis appended below may be of some referential value:—

Flour	Water	Nitrogen	Fat	Percentage of sugar	Dextrin	Starch	Ash
1st grade	13.28	10.14	0.90	2.40	3.24	69.22	0.50
2nd grade...	13.40	10.08	1.30	2.25	3.17	68.87	0.40
3rd grade...	12.95	9.84	0.86	2.38	3.48	69.52	0.46
4th grade...	12.60	11.06	1.28	1.78	4.02	66.63	0.95
5th grade...	13.30	10.95	1.19	1.84	4.11	66.71	0.97

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Flour milling in North Manchuria used to lie mainly under Russian management, and in both capital amount invested and technical skill, the Chinese could not hold a candle to the Russian plants. Since a few years ago, Chinese mills of extensive proportions have been founded at Harbin and elsewhere in quick succession, and now their influence is not at all to be despised.

Looking into the cause of this sudden rise in importance, the enfiltration of considerable German capital has been brought to light. For instance, the three mills at Harbin such as the Chengfahsiang, the East Asia, and the Chengtaii ostensibly belong to Chinese management, but are all really financed with purely German capital. The nominal Chinese managers hail from Shantung, and from this fact, it may be inferred that the Germans set up in business at Tsingtao and elsewhere in Shantung employed Chinese for agents to the end of expanding their own sphere of operation without attracting others' attention.

NATIVE FLOUR MILLING.

The native flour mills are known more popularly as home mills. They are on a small scale and require far less capital than wanted by either shumshu distilleries or bean mills. They are run in quite many cases by way of a bye-industry by those who carry on some other fixed avocations. At farm houses one or two mill stones are installed to be worked at leisure time. Shumshu distilleries, bean mills, cereal shops, groceries, confectioneries, tea-houses, and inns are often engaged in flour milling as an auxiliary enterprise.

Home milling is one of important domestic industries in Manchuria. Its outputs dominate the interior market. Much surplus supply being left, it used to be exported far into Russian territory to meet the needs of the Russian inhabitants. Now that mechanical flour milling has sprung up at different centres, the home milling is gradually pressed into a decline. However, the scope of demand for flour (produced by mechanical milling) is still quite limited, its consumers being confined to the foreigners and the Chinese above the middle classes at the cities and along the railways. The conservative Chinese masses, who adhere to the old habits like a vice, are still partial to the products of the home mills, which, on this account, still remain a factor to be reckoned with.

The outputs of these home mills, compared with those produced by mechanical

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milling, are of coarser quality and far from milk white in colour. They are adulterated with much foreign matter, but are regarded to have plenty of cohesive power and to have an agreeable flavour by many Chinese.

The following is the result of analysis of home-milled flour by the Chinese Eastern Railway :—

	Water	Nitrogen	Starch	Fat	Dextrin	Ash
Sample A.....	11.74	11.95	66.74	1.45	4.12	0.98
B.....	10.76	12.50	67.04	1.99	4.01	1.05
C.....	12.53	10.96	67.32	1.26	3.90	0.98

The impurities found to be contained in the above by the same analysis are as under :—

	Wheat flour	Corn meal	Millet meal	Bean meal	Bran	Ash & earth
Sample A.....	82%	18%	—	—	—	—
B.....	80%	—	—	8%	4%	8%
C.....	75%	10%	5%	—	5%	5%
D.....	85%	—	—	—	—	15%
E.....	68%	20%	10%	—	2%	—
F.....	60%	30%	—	—	—	10%
G.....	62%	8%	20%	5%	—	5%
H.....	58%	42%	—	—	—	—
I.....	60%	8%	—	12%	6%	14%
J.....	90%	—	—	—	—	10%

The producing capacity of a mill-stone used at the home mills may be described as follows :—

The mill stone is made of granite or other kind of stone and is from 2 ft. to 3 ft. in diameter, being about 1 ft. in thickness. Two such pieces of stone are put, one on top of the other. To work the mill stone four donkeys and a couple of coolies are employed, half the number of donkeys taking turns to work and rest alternately. One such mill stone can dispose of some 1.5 *koku* of wheat a day. One of the men acts as driver to the donkeys and the other undertakes to sieve the flour.

The following is a table giving both daily earnings and outlays for one mill stone with a hired man and a donkey, in Fuyu Prefecture, Kirin Province :—

Earnings.

	Price.
Wheat flour, 200 *kin*.....	110 *tiaos* (@0.150 *tiaos* per *kin*)
Wheat bran 40 *kin*.....	10 „ (@5 *tiaos* per *to* or about 20 *kin*)
	120 *tiaos*

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Outlays.

Wheat, 8 *to*	92 *tiaos*	(@1.500 per *to*)
Labourer, one man per day	4 „	(@80 *tiaos* per month besides
Donkey	12 „	40 *tiaos* for board)
	108 *tiaos*	

Balance 12 *tiaos*, net profit

As to the fixed capital invested, one mill-stone costs from 300 to 500 *tiaos*, and a donkey from 150 to 200 *tiaos*.

ACCUMULATION & DISTRIBUTION OF WHEAT FLOUR.

(a) Mukden.

Of late the advance of the standard of living of the Chinese has been remarkable. Even the lowest coolies are no longer contented with kaoliang, millet, maize, etc., as of old, and the demand for wheat flour is on the increase annually. On the Mukden market, before 1909, there had been nothing but American and native flour. On the establishment of the Manchuria Flour Mill, Ltd., at Tiehling, the American import began to be crowded out slowly, when an anti-Japanese boycott was started in October of the same year, and this fine opening was taken advantage of by the Russian mill-owners at Harbin, Shuangchengpu, Kwanchengtzu, etc. At the same time, Shanghai and Hankow outputs appeared on the market, each striving for supremacy. In 1910, the anti-Japanese fever vanished, and Tiehling flour re-appeared at Mukden, recovering its lost market. American flour is not met with after the great War, and Tiehling flour (inclusive of outputs of the Changchun branch factory of the Tiehling Mill) and Harbin flour are now competing for the honours.

The South Manchuria Railway Company's Annual Statistics give the arrival and despatch tonnages of flour at Mukden Station during recent three years as follow :—

To & from Main Line.

	Despatches tons	Arrivals tons
1916	3,769	20,155
1917	6,046	28,052
1918	9,172	29,500

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To & from Mukden-Antung Line.

1916	1,932	62
1917	1,818	26
1918	3,280	240

Sent out of Mukden.

	South of Mukden	North of Mukden	To Mukden-Antung Line	Total
1916	3,169	600	1,932	5,701 tons
1917	5,439	607	1,818	7,864
1918	8,207	965	3,280	12,452

(b) Tiehling.

Tiehling being the seat of the Manchuria Flour Mill, Ltd., its products are distributed from Tiehling as under, according to the returns of the S. M. R. Co. Annual Statistics:—

	Despatches	Arrivals
1916	11,474 tons	1,126 tons
1917	6,971	4,021
1918	14 960	2,507

(c) Changchun.

Before 1908, the Changchun market had been supplied almost wholly by the home mills, but mechanically milled flour has been pushing itself to the fore since. Still the home mills are putting on the market their outputs to the annual amount of from 700,000 to 800,000 *kin*. As previously stated, the Manchuria Flour Mill, Ltd., opened a branch plant at Changchun in 1913, manufacturing some 700,000 sacks of flour a year, to be pitched against the Harbin flour from the north and foreign imports from the south. In 1914, the Yushun Flour Mill (Chinese) of Hailun, too, founded a branch plant at Changchun, turning out not less than 250,000 sacks per annum.

The local consumption is estimated at about 400,000 sacks a year.

The despatch and arrival tonnages at Changchun follow:—

To & from S. M. R. Lines.

	Despatches tons	Arrivals tons
1916	31,525	17
1917	35,741	54
1918	18,951	1,569

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To & from Chinese Eastern Railway.

1916	—	10,796
1917	—	12,574
1918	20,501	4,294

Sent out of Changchun.

	South of Mukden	North of Mukden	To Mukden-Antung Line	Total
1916	32,301	7,459	3,421	43,181
1917	42,849	10,098	4,296	57,243
1918	29,969	6,874	2,609	39,452

Of the above, the consignments sent from the Chinese Eastern Railway were returned at 11,387 tons, 21,502 tons, and 20,471 tons for 1916, 1917, and 1918 respectively.

TRADE PRACTICES IN DEALING IN FLOUR.

Mechanically-milled flour in Manchuria is dealt in according to trade marks and graduation of quality. The unit of quotation is one sack of 37½ *kin* and is quoted in gold yen, Yokohama Specie Bank silver yen, Chinese small silver coins, large dollars, etc. Hitherto, Chinese small silver coins were most popular as the standard of quotation, but since their fickle fluctuations have created considerable risk, the gold and the Y. S. B. silver yen note standards have become the best acceptable, the merchandise quoted in gold yen being quotable by the gold standard and what is quoted in silver yen being quotable by the Y. S. B. silver yen note standard.

In actual business transactions, there are two modes of cash transactions and business on trust. Most of the Chinese who constitute the principal buyers prefer business on trust even at a somewhat stiffer price. For business on trust, either a guarantor of good credit is required, or security (in the form of a Bank deposit) has to be produced. The time allowed for payment is usually 30 days. It is said that, in such as flour business, the credit of the Chinese merchants is generally sound.

Chinese Uses of Flour.

The most popular use of flour by the Chinese is to make a sort of steamed dough to be taken along with meat and vegetables. Its variety is given below :—

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Noodles, macaroni, spaghetti, vermicelli, beef dumplings, mutton dumplings, pork dumplings flavoured with garlic or seasoned with swallow's nests, baked dumplings, fried dumplings, fruit dumplings, pan cake, and such like.

FLOUR AND WHEAT TRADE CONDITIONS.

Flour Trade Conditions.

(a) Import.

As already observed, mechanically-milled flour wanted in South Manchuria was formerly procured mainly from the United States and South China. American imports, inclusive of direct imports and those via Japan, occupied about 50% of the total figures. Shanghai flour came next, taking up about 40%. As remarked previously, as a result of the great world war, American product has practically disappeared from the Manchurian market, and, whilst Shanghai flour had little to spare for export to Manchuria, North Manchurian flour pushed itself southward. Since the products of the Manchuria Flour Mill were sufficient to fill the best part of wants of Manchuria, its flour market has been raised to a self-supplying footing, and now only a comparatively small amount is finding its way into Manchuria from Japan and China ports.

The flour imported into the three Manchurian ports during recent three years follows, according to the North China Annual Trade Report:—

	1917	1918	1919	1917	1918	1919
	piculs	piculs	piculs	taels	taels	taels
Dairen	467,979	503,374	—	1,862,772	2,112,915	2,205,099
Newchwang	65,034	117,050	152,556	285,551	536,876	656,117
Antung	74,944	193,126	258,357	142,049	888,850	1,116,607
Total	607,957	813,550	—	2,290,372	3,538,641	3,977,823

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Origins of Import Flour.

1) Dairen.

From	1917 piculs	1918 piculs	1919 piculs	1917 taels	1918 taels	1919 taels
Japan	209,831	24,750	8,260	755,392	132,907	43,778
China ports	257,998	476,749	238,973	1,107,326	1,969,939	2,153,371
Chosen...	150	1,875	790	54	10,069	3,975
Hongkong	—	—	750	—	—	3,975
Total	467,979	503,374	248,773	1,862,772	2,112,915	2,205,099

2) Newchwang.

From	1917 piculs	1918 piculs	1919 piculs	1917 taels	1918 taels	1919 taels
Japan	21,046	1	2	75,766	3	14
China ports	43,988	117,049	152,540	209,785	536,873	656,105
Total	65,034	117,050	152,556	285,551	536,876	656,119

3) Antung.

From	1917 piculs	1918 piculs	1919 piculs	1917 taels	1918 taels	1919 taels
Japan	2,466	—	—	9,199	—	—
China ports	65,325	193,092	257,915	104,857	888,661	1,116,165
Chosen...	7,153	34	81	27,993	189	442
Total	74,944	193,126	257,996	142,049	888,850	1,116,607

Distribution of Import Flour.

1) Via Dairen.

From	1916 tons	1917 tons	1918 tons
South of Mukden	5,585	10,831	15,362
North of Mukden	16	1,619	2,082
Mukden-Antung Line	—	159	473
Total	5,601	12,609	17,917

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2) Via Newchwang.

For	1916 tons	1917 tons	1918 tons
South of Mukden	3,091	1,601	2,025
North of Mukden	5	11	75
Mukden-Antung Line	1	10	1
Total	3,097	1,622	2,101

3) Via Antung.

For	1916 tons	1917 tons	1918 tons
South of Mukden	—	26	120
North of Mukden	—	—	13
Mukden-Antung Line	542	572	2,015
Total	542	598	2,148

In North Manchuria, unlike South Manchuria, mechanical flour milling was founded early at Harbin and elsewhere. The mills there could supply all wants and left no room for the entry of foreign flour. Further, the surplus stock was supplied to South Manchuria and Russian territory. The import of foreign flour has been made only in a small quantity as the market quotations made it negotiable.

(b) Export.

China has established a system of preventing the export of cereals as a traditional economic policy. Both wheat and wheat flour are contrabands in China, and, although their transportation in China itself is permitted in principle, their export abroad is not permissible except under some special circumstances.

China with her fertile soil has depended chiefly upon her agricultural resources for her economic assets. She has been supplying her own wants and has had no occasion to feel the need of outside assistance. Moreover, the Chinese being extreme conservatives, they appear to have put it into their heads that the export of her cereals abroad is liable to prove hazardous in emergency. The frontier trade over the boundary line is regarded as an exception.

The export of flour, according to the North China Annual Trade Report, is as follows :—

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Export of Flour from South Manchuria.

via	1917 piculs	1918 piculs	1919 piculs	1917 taels	1918 taels	1919 taels
Dairen	117,153	53,835	32,574	532,526	225,598	143,976
Newchwang... ...	4,836	1,276	544	16,184	5,895	2,497
Antung	41,118	88,766	109,143	145,215	467,945	593,816
Total	163,107	143,872	142,267	693,925	699,438	470,289

Export from Nortn Manchuria to Russian Territory.

via	1917 piculs	1918 piculs	1919 piculs	1917 taels	1918 taels	1919 taels
Aigun	367	41,839	29,194	1,795	213,379	145,970
Sanhsing	2,110	16	15,039	8,988	80	45,717
Manchouli	572,229	52,977	396,174	1,459,184	169,526	594,261
Harbin	42,984	21,679	67,187	98,004	89,968	386,325
Pogranichnaya ...	14,798	253,364	177,236	50,322	1,283,073	570,711
Total	632,488	369,875	684,830	1,618,293	1,756,026	1,742,984

Despatches and Arrivals of Flour.

(According to S. M. R. Co. Annual Trade Report).

At Dairen.

	Despatches	Arrivals
1916	5,601 tons	6,189 tons
1917	12,493	12,624
1918	17,880	69,71

At Yingkou (Newchwang).

1916	3,097	4,911
1917	1,622	5,581
1918	2,101	3,352

At Antung.

1916	542	1,269
1917	574	1,571
1918	2,138	2,207

Wheat Trade Conditions.

With the object of fostering flour milling in the interior of China, all wheat for export from a China port to another was exempted from export duty by a Customs

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notice on April 30, 1917. Later on May 30 of the same year, by an instruction of the Finance Office, Peking, it was exempted also from *likin* tax. The latter exemption was to remain in force only for a year, but the encouragement of domestic industries being aimed at, the same is understood to be extended indefinitely unless some unforeseen events happen.

The amount of wheat shipped out of Dairen, Newchwang, etc., has shown an increasing tendency year after year. Dearth of food-stuffs in all Europe in consequence of the European War is felt most acutely. Especially, wheat, the chief food-stuff of the Westerners, has turned out a miserable failure. Moreover, in European Russia, South America, Marseilles, the United States, Australia, Shantung and Chihli, the wheat crop was estimated to come out 50 or 60%. Furthermore, in European Russia, the agricultural classes have been shaken up by the prolonged civil war, and the farms have mostly become laid waste.

Turning to North China, it was visited by an unparalleled drought, and cases of death by starvation are reported in large numbers, the most heartrending miseries prevailing in the afflicted zone beggaring description.

The general failure of wheat crops in different parts of the world has made Manchuria one of the principal suppliers. Of late the exodus of Manchurian wheat Europe way has continued exceedingly brisk, and most of the steamers for Europe leaving Dairen have loaded wheat. The ports of destination were chiefly in England, France, Italy, Germany, etc. The wheat contracted to be exported from May till the middle of August last amounted to about 180,000 tons, of which the actual exports have totalled some 120,000 tons. The wheat stocks under storage on Dairen Wharves on August 31st, 1920, reached 140,000 tons, being more than 100 times the amount for the same date of the preceding year.

For reference sake, the export amounts of wheat from South Manchuria during three recent years are, according to the Chinese Customs statistics, as under:—

	1916 piculs	1917 piculs	1918 piculs	1916 taels	1917 taels	1918 taels
Dairen	85,540	178,907	437,517	213,850	422,578	1,225,048
Newchwang	44.429	3 386	47,649	131,954	10,903	137,229
Antung	3,603	1,451	2.514	12,226	4,567	6,875
Total	133,752	183,744	487,660	358.030	439,048	1,369,152

The import of wheat into South Manchuria is trifling, the major portion of the import being in the form of wheat flour. The wheat import table follows:—

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	1916 piculs	1917 piculs	1918 piculs	1916 taels	1917 taels	1918 taels
Dairen	1,167	1,741	—	3,384	5,223	—
Antung	67	21,476	5	228	43,292	42
Total	1,234	23,217	5	3,612	48,515	42

Despatches and Arrivals of Wheat.

At Dairen.

	Despatches	Arrivals
1916	55 tons	15,528 tons
1917	179	3,758
1918	307	17,487

At Yingkou (Newchwang).

	Despatches	Arrivals
1916	186 tons	28 tons
1917	207	156
1918	3,663	923

At Antung.

	Despatches	Arrivals
1916	—	37 tons
1917	—	208
1918	92 tons	60

In North Manchuria, since the opening to traffic of the Chinese Eastern Railway till after the Russo-Japanese War, the demand for wheat suddenly increased with the influx of Russians, and as a result, the area of cultivation of wheat has increased correspondingly, and, after the War, some was exported to Russian Amur Province and Ussuri. In January, 1913, the free trade zone, 50 versts wide, on the Russo-Chinese frontier was abolished, and, in spite of a heavy tax levied upon wheat flour, wheat remained duty-free, and, as a reactionary effect of a sharp decrease of export of flour, the export of wheat inversely increased. From October, 1915, wheat came to be also taxed by the Customs at 33 kopeks per pud. This shook the position of North Manchurian wheat, and brought about the import of Siberian wheat.

The Harbin flour mills, with all their promise of an expanding market, were pressed for wheat supply, and, in 1915, caused an instruction to be issued to the Manchouli Customs through the assistance of the Harbin Chamber of Commerce,

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to the effect that, war contraband as wheat is, it could be exported to Manchuria from Siberia by the end of the same year up to the amount of 2,000,000 puds. Thus, Siberian wheat began to be imported into Manchuria for the first time. Its excellent quality, coupled with its moderate price, it rapidly rose in popularity, but, in the course of some months, the Russian revolution broke out, and the stores in Russia proper having run short, the export of Siberian wheat into Manchuria became interrupted.

Export of Wheat from North Manchuria

To Siberia

Via	1916 piculs	1917 piculs	1918 piculs	1916 taels	1917 taels	1918 tales
Aigun	2,439	1,676	328	6,768	4,140	770
Sanhsing	263,930	155,340	588,784	488,270	170,874	883,082
Manchouli	344,958	36,609	295,710	600,227	67,737	195,169
Harbin	—	1,924	7,763	—	3,752	16,302
Pogranichnaya ...	901,337	682,685	1,353,991	2,086,312	899,577	2,437,184
Total	1,512,664	878,234	2,246,576	3,181,577	1,146,080	3,532,507

Import of Wheat from Siberia into North Manchuria

To Siberia

Via	1916 piculs	1917 piculs	1918 piculs	1916 taels	1917 taels	1918 taels
Sanhsing	3	—	—	4	—	—
Manchouli	58,050	—	—	126,549	—	—
Total	58,053	—	—	126,553	—	—

In South Manchuria, flour used to be quoted at ¥4 per sack till about June and July, 1919. It showed a gradually rising tendency with the ascent of the Japan and Shanghai markets, going up to ¥5.30 by August of the same year. As Silver steadily advanced and as the demand in Siberia grew more pressing, the price soared up to ¥6.30 towards the end of the same year, reaching ¥6.50 by the old Chinese New Year holidays in January, 1920, when the Chinese demand

Note:—By the order of the Inspectorate-General of Customs, Peking, the export of six kinds of cereals and wheat flour from Manchuria was tabooed from December 20, 1920, and a turn in the situation was taken. Thanks to the negotiations of the Japanese authorities concerned, an exception has been made of wheat flour. As to wheat, its export has been made permissible under certain restrictions. Reference is invited to the news columns elsewhere.—Ed. *L. of M.*

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remarkably swells customarily. The Shanghai market continued to rise with the flight of silver. The flour market in Japan, too, according as the price of rice mounted, got firmer, and the flour market all over the Orient manifested an exceptional activity.

In March, 1920, the last of the post-war inflation was seen, followed immediately by a reactionary depression, and a general fall of the prices ensued, inclusive of the flour market. From May the Dairen quotation dropped to about ¥4.

However, the demand for flour in the European countries kept brisk, whilst, in the countries, which served as the suppliers of flour, the wheat crops failed wretchedly this year, and this induced the export of Shanghai and Manchurian flour to Europe. The effect of this new tendency on the Manchurian flour market was considered as worth close following.

Flour Market Quotations at Dairen.

	Shanghai flour "Sanma" S.¥	N. Manchuria flour "Elephant" G.¥	S. Manchuria flour "Blue Carp" G.¥	Shanghai flour "Fooshou" S.¥	N. Manchuria flour "Sun" G.¥
January	2.60–2.90	5.80–6.20	5.90–6.30	2.65–2.95	5.85–6.20
February	2.85–2.80	6.20–6.30	6.25–6.35	2.90–2.85	—
March	2.65	6.00	6.05	2.72	5.95
April	2.55–2.53	5.60–5.00	5.30–5.05	2.60–2.58	5.55–4.95
May	2.80	4.30	4.30	2.90	4.20
June	2.75	3.80	3.80	3.05	3.70
July	2.75	4.05	—	2.95	—
August	2.75	4.05	4.10	2.95	—

Flour Market Quotations at Mukden.

	Red Dragon (of Manchuria Flour Mill) G.¥		Red Dragon (of Manchuria Flour Mill) G.¥	DoubleStar (North Manchuria) S.¥
January	7.30	April	6.00–5.30	2.45–4 20
February	7.30–7.30	May	4.30–4.55	—
March...	6.30–6.00			

The wholesale prices of flour at different centres at the end of 1917, according to the Twelfth Number of the Kwantung Government-General Statistics, were as under :—

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At	Tiehling flour	Shanghai flour	American flour	Harbin flour
Port Arthur	¥ 4.20	¥ 3.30	—	—
Dairen	3.65	2.65	—	—
Wafangtien	3.70	3.50	—	¥ 3.60
Tashihchiao	4.05	3.95	¥ 4.10	3.90
Liaoyang	4.00	4.00	4.15	4.05
Mukden	4.50	—	—	4.00
Penchihu	4.56	4.10	—	—
Fushun	4.30	—	—	—
Tiehling...	3.60	—	—	4.20
Kaiyuan	4.80	—	—	4.68
Changchun	3.80	3.90	4.00	3.70
Ssupingkai	4.00	4.00	—	—
Kungchuling	4.60	—	—	—

Judging the North Manchurian market from all data at command, the carrying power of the Chinese Eastern Railway gradually ebbed from about the spring of 1919, adding to the difficulty of the sending of Harbin flour southward. The abnormal rise of Shanghai flour due to the flight of the Silver market and the almost prohibitive price of Japanese flour owing to the dear prices of wheat worked together to stiffen the South Manchurian market, widening the margin at the flour centres in North Manchuria. Then, the strike of the Chinese Eastern Railway employees took place from July to August, 1919, crippling the transporting capacity of the line worse to the greater menace of the economic world. The languor was in sharp contrast with the lively tone of the South Manchurian market. The mill-owners in North Manchuria could not prevent letting slip the favourable opportunity, sitting tight idly.

Then, relative to the dealings with Siberia, the precariousness of operation of the Siberian railways, the diminishing of navigable facility of the Sungari from the shrinking up of its water due to the continued drought, and the disorganization of the Russian currency system all forced the dealers to despair of any business to speak of to be put through.

Then, from September to October, 1920, Shanghai flour was pushed up by the Silver exchange, and Japanese flour by the flight of rice price, and neither could be put on the South Manchurian market. This afforded an opening to Harbin flour to pitch into South Manchuria, and the Harbin mills were kept at lively work. The demand in South Manchuria rose higher from about October with the approach of the old Chinese New Year, but the low-toned transport

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power of the railway fell far short of the requirements, and many a fine chance was let slip.

In December, the Chinese Eastern Railway opened the express freight service, and this was availed of by the flour dealers to forward stocks South Manchuria way. The local sales were also favourable. But, with all this, things continued slack in North Manchuria, compared with South Manchuria, and it is said that not a few plants have suspended operation.

The prices of flour, according to the bulletin issued by the Harbin Commercial Museum, were

1st grade flour per sack of 5 puds	... ...	G.¥16
2nd „ „ „	... ...	15
3rd „ „ „	... ...	14
1st grade flour for export per sack of 1 pud 15 punts	...	4.50
2nd „ „ „ „ „	...	4.40
3rd „ „ „ „ „	...	4.25

Wheat Market Quotations.

About June and July last year, the wheat market in Manchuria was well stocked, compared with a usual year, whilst the transportation service was attended with difficulty, dragging down the prices at the producing centres. New wheat was about to appear on the market then, and the market was quite dull. By August the reports of poor wheat crops were received from different quarters; the quotations began to be lifted; export to Japan and the revival of the flour market sent up the market.

About October the wheat market in North Manchuria, under the influence of the slump of roubles, gave extremely alarming quotations, until matters got improved after the latter part of November in anticipation of indifferent crops and short stocks, the price going up to ¥1.20-1.30 per pud.

In December, with the introduction of an express freight service, the exporters concerned started active buying, and the prices advanced to ¥1.30-¥1.40. But because of the sinking of the flour market in Japan, the export of wheat in that direction became impossible, and by April this year, the price fell to ¥5 per 100 *kin*. With the receipt of successive orders from Europe, it climbed up to ¥6.50 per 100 *kin*, the tone remaining very firm.

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Love Stronger than Death.

By Mr. Z. Hamamura.

Dear, our love is stronger than death;
Life's too short and the flesh too wise;
Like blooms emitting fragrant breath,
The mortal frame withers and dies.

Dear, th' instinct of gain supreme reigns
In e'ery throbbing heart and soul
That too oft self-sacrifice feigns,
But is playing an assumed role.

Dear, in these latter days, love is
A bargain for mutual pay.
A tithe is ta'gn for a stolen kiss,
And for sustenance life's giv'n 'way.

Dear, love's bond is so flimsy and
May, at the slightest shock, be split:
Its temple crumbles as a house of sand;
Like water, sweethearts part and quit.

Dear, not so with us, whose hearts are
True as steel and pure as crystal;
They both glitter in beauty rare,
Glowing ruby with fire 'ternal.

Dear, let us be wed forever,
Sailing on th' tide of endless time,
As the ark lade'n with Love's treasure,
From which rises the sweetest rhyme.

PERSONAL ITEMS.

LOCAL AMERICAN CONSUL.

Mr. I. C. Correll, American Vice Consul in charge, Dairen, left Dairen on December 17 for Yokohama at the news of his sister's death.

The local American Consulate was placed under charge of Mr. Harvey T. Goodier of the American Embassy, Tokyo, during Mr. Correll's absence which was to last about a fortnight.

Mr. M. C. NICHOLLS.

Mr. M. C. Nicholls, of Messrs. Samuel Samuel & Co., Kobe, arrived at Dairen on December 15 in company with Mrs. Nicholls to assume charge of the firm's local branch to succeed Mr. F. Miedbrodt, who is to go home to England on furrough.

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CURRENT NEWS.

CHINESE EASTERN RAILWAY AND THE POWERS.

Observation of Mr. H. Nagao.

Mr. H. Nagao (Representative of Japan on the Chinese Eastern Railway International Control Board, who had met Lieut.-Gen. Hoshino of the Japanese Army at Seoul on his way from Japan and later met M. Lachinoff (Assistant Director of the Chinese Eastern Railway) at Mukden) arrived at Dairen on the evening of December 3rd, leaving for Peking on the 5th and returning to Harbin about the 20th, and is said to have remarked to a local press representative to the following effect:—

The Chinese movement to recover the right to the Chinese Eastern Railway only means to get back the railway running in Chinese territory, which has remained in Russian possession while Russia's influence in that locality was preponderant, taking advantage of Russia's present state of practical dissolution. Only, the fact of the Powers being financially interested in the same railway seems to put on a complexion of impossibility upon China's desired recovery of the absolute control of the railway in question.

In passing, the Railway used to lie under Lieut.-Gen. Horwath, Director. As Mr. Kuo-tsunghsi (ex-Governor of Kirin) assumed his post as President of the Line, the Lieut.-General still retained his real power as Director-General. On the establishment of the Koltchak Government, the Lieut.-General was made Supreme Adviser, while M. Lachinoff (engineer) was appointed Assistant Director. When subsequently Mr. Tsung-hsiaolien became President with M. Kazakevich for Acting Director, the Chinese influence gradually rose over Russia. At present the Directorate controlling the administration of the Chinese Eastern Railway Area and also the technical functions of the Railway consists of five Chinese and as many Russians. The Directorate is presided over by President Tsung assisted by M. Lachinoff. This Directorate was organized at a conference held at Peking and has the authority to look over education, medical affairs, religious matters, and meteorological observatories. It must be mentioned, however, that the decisions of

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the Directorate are not final, but are made subject to the approval of the International Control Board, which is often referred to as International Technical Department, consisting of

Mr. Beckett (Great Britain), Col. Stevens (the United States), M. Pannion (?) (France), M. Danilevsky (Russia), Mr. Wang-chingchun (China), and Mr. H. Nagao (Japan).

Col. Stevens has presided over the Directorate from the start. At a time, Italy and Czecho-Slovakia were also represented in the Directorate, but no longer.

The Powers' investments were ¥8,000,000 by Japan, ¥8,000,000 by the United States, and ¥1,000,000 by China. The American investment had been spent last year and the Japanese money is now in use. The general financial condition of the Railway being in extreme straits, some adequate expediency must be resorted to.

Why Great Britain has desisted from investing was perhaps because her proposal to supply funds on condition of selling British railway materials was not accepted. As for France, she was too much engrossed in the relief of her friendly countries in Eastern Europe. It was under such conditions that Japan and the United States furnished the required funds. It was rumoured that Col. Stevens's return to the United States is for raising ¥20,000,000 loan, but there can be no foundation of fact in this report.

The Chinese Eastern Railway is related to the South Manchuria Railway by the interlineal through traffic arrangement, but more directly by the purchase of Fushun Coal, which is consumed by the line to the annual amount of about ¥4,000,000 worth. The centre of the Chinese Eastern Railway is transient according to the transition of its controlling power. At present Peking seems the centre of its administrative power.

DAIREN EXPORT & IMPORT TRADE RETURNS.

1908—1919.

Comparing the export business of the port of Dairen with its import business since 1908, in which year the South Manchuria Railway Company opened the Wharf Office, the average ratio between export and import during the first twelve years was 73.2% to 26.8%, that is, 2.7 to 1 for export and import respectively.

The table of the gross trade-tonnages (both exports and imports combined), with the relative ratio between exports and imports, follows:—

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	Gross export & import tonnage	Export %	Import %
1908	777,766	0.567	0.433
1909	1,270,486	0.803	0.197
1910	1,291,085	0.714	0.286
1911	1,407,761	0.704	0.296
1912	1,557,320	0.702	0 298
1913	2,105,985	0.755	0.245
1914	2,104.590	0.758	0.241
1915	2,270,036	0.763	0.237
1916	2,331,446	0.743	0.257
1917	2,988,856	0.721	0.279
1918	3,447,699	0.723	0.269
1919	4,223,775	0.666	0.334

Of the exports from Dairen, the principal articles are agricultural produce which takes up from 80 to 90% of the annual export tonnage. Of the agricultural produce, what is available as food stuffs and industrial materials is wheat, beans, etc. The brisk exodus of bean oil during the war was due to its use for manufacture of explosives.

The imports consist for a larger portion of building materials, kerosene oil, miscellaneous goods, etc. Daily necessaries are imported chiefly from Japan, and building materials and machinery almost wholly from Europe and the United States.

POPULATION OF CHOSEN.

A Little over 17,000,000.

According to the First National Census taken all over Japan and her colonies, inclusive of Chosen, on October 1st, 1920, as published by the Government General of Chosen, there were on that date altogether 17,264,119 people in 3,297,126 households, including 8,903,000 males and 8,361,119 females, divided as under :—

	Households	People
Japanese	93,488	346,496
Koreans	3,196,551	16,891,289
Foreigners	7,087	26,334

Compared with the figures for the end of 1919, an increase of some 110,000 people was noted. The increase of the Koreans was over 100,000 and that of the foreigners over 6,000, but the actual Japanese inhabitants showed a decrease

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of 123 people. It is possible that the business dullness in the Peninsula and the prolonged agitations therein caused a number of Japanese to give up their quest of fortune in the Peninsula and go back home to Japan.

NEW COLONY FOR BUILDING CONTRACTORS' EMPLOYEES.

A new colony is in process of construction at Tanchiatun at the west of the S. M. R. Co. General Laboratory, Fushimidai, Dairen. The first lot of houses having been finished, tenants began removing into them early in December, 1920. Out of altogether 368 houses to be erected, 174 two storeyed and 94 flat dwellings were completed. This colony, when founded, is to be automatic, though unofficially, and is to provide itself with sanitary, fire-extinguishing, and night patrolling arrangements.

It may be mentioned that, out of the total capital of ¥2,000,000 of the Shotokukai, a society organized for the benefit of employees of the local building contractors, ¥1,500,000 has been laid out during the current year. Each tenant is entitled to the ownership of the dwelling he occupies in the course of ten years and is required to pay as monthly instalment the respective amounts of ¥68, ¥39, and ¥31 for a two-storeyed dwelling and flat dwellings of Class A and Class B.

A hospital and an apprentice school are also under project. Everything possible will be done to make the colony a model one, especially in social welfare.

BUBONIC PLAGUE IN NORTH MANCHURIA.

The bubonic plague in North Manchuria was on the spread. According to a report from the Epidemic Prevention authorities stationed in North Manchuria dated December 1st., after an unreserved consultation between Dr. Woo-lienteh (Superintendent of Harbin Hospital) and a Russian medical expert of the Chinese Eastern Railway and the chief medical officer of the Japanese Epidemic Prevention Department, decided to enforce a strict quarantine over the people entraining and detraining at Harbin Station. The plague spread at small villages such as Abakaido, Kailust, Kepsikai, etc. On the opposite side of the River there are Chinese

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and Mongolian villages, and the Chinese Epidemic Prevention authorities are exercising more rigorous vigil.

FIRST COLD WAVE AT DAIREN.

11° Below zero on December 8.

Due to the appearance of a high atmospheric pressure Mongolia way and a depression over the Sea of Japan, a sudden fall of the mercury was experienced on the night of December 7 and at 5 a.m. on the 8th, the temperature dropped to 22° below zero at Changchun and 11° below zero at Dairen. The sharp difference in the atmospheric pressures gave rise to a stiff wind in South Chosen, and at Mokpo it blew at the velocity of 16 metres from the 7th. The gale continued to rage and interfered seriously with the ships at sea.

PRAISEWORTHY IMPROVEMENT OF S. M. R. TRAFFIC SERVICE.

Eloquent Statistics Given.

The Traffic Department of the South Manchuria Railway Company has done everything conceivable to prevent the congestion of freight goods along the interior lines, and the goods car famine partly from the damage to the axle-boxes owing to the intense cold such as was experienced two years ago. The meritorious efforts of the Department have borne happy results, and not a case of damage to a locomotive or to a goods car has yet been reported; the distribution of goods cars has been effected with the utmost satisfaction to all parties concerned. In fact, the goods traffic showing all over the S. M. R. Manchuria Lines has never been worked so admirably as at present. This speaks a volume for the Management, seeing the remarkable increase of both passenger and goods traffic.

As against the average daily goods tonnage of 23,719 tons carried by the S. M. R. Lines in December, 1919, the figures for the first five days of the same month, 1920, were as under:—

December	December	December	December	December
1st, 28,628 tons	2nd, 28,994 tons	3rd, 30,569 tons	4th, 28,096 tons	5th, 28,356 tons

As may be seen from the above, the daily increase in tonnage exceeded 5,000 tons, which makes the monthly increase of over 150,000 tons.

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Next, the comparison of the daily average total tonnage of the stored goods along the Railway Lines for December, 1919, with the corresponding figures for the first five days of the same month, 1920, is as under:—

Daily average for December, 1919	60,492 tons.
For December 1, 1920	35,252 „
2, „	38,672 „
3, „	36,832 „
4, „	36,869 „
5, „	35,714 „

The above indicates eloquently what a wonderful improvement has been introduced in the most difficult and complicated work of distributing the goods cars to the Company's clients.

Another interesting set of statistics is added below, showing the numbers of goods cars wanted by the clients:—

Daily average number of goods cars demanded in December, 1919	3,105 cars
For December 1, 1920	1,411 „
2, „	1,425 „
3, „	1,359 „
4, „	1,388 „
5, „	1,345 „

The marked decrease in the numbers of goods cars required was due to the same cause as the decrease in the figures of the stored goods along the Lines above mentioned.

It may be added that the excellent distribution of goods cars has been made possible in part due to the decrease in the number of goods cars thrown out of service for repairing, which is borne out by the undermentioned table:—

By the side of the daily average of 358 goods cars taken off the service for repairing in December, 1919, the figures for this year are as under:—

On December 1, 1920...	135 goods cars
2, „	104 „
3, „	107 „
4, „	105 „
5, „	138 „

That the figures have become reduced this year by more than half may be ascribed to the greater efficiency of the Railway Workshops, Shahokou.

Baron Okura (Assistant Managing Director of the Traffic Department) appeared

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highly gratified at the splendid manner, in which the Company's busy traffic is being handled. It was reported that the extensive goods yard of the Railway Station, Changchun, was practically empty, and, from the present augury, this season's produce traffic promises to be conducted most smoothly. The Baron added that there was still room for study and improvement and the Company's effort to better the service would not be relaxed at all.

TRADE & INDUSTRY.

BRITISH CHAMBER OF COMMERCE, DAIREN.

First Official Dinner at the Yamato.

The British Chamber of Commerce, Dairen, which was newly organized gave a dinner at the Yamato Hotel on the evening of December 9, 1920. H. E. Governor I. Yamagata, of Kwantung, Post Master-General J. Kato, Civil Administrator Nakano, Deputy-Mayor Takahama, Directors K. Nakagawa and K. Sugiura of the South Manchuria Railway Company, Customs Commissioner Ebara, Chairman Aioi of the Dairen Chamber of Commerce, and Mr. Y. Suitsu (local Manager of the Yokohama Specie Bank) were present as the guests. Mr. W. B. Cunningham (new British Consul) acted as senior host and was assisted by Mr. Frederick Larkins, Mr. F. J. Bardens, Mr. Fred. D. Thompson, Mr. R. Brock, Mr. T. Pearson, Mr. G. Candlin, Mr. R. Denniston, Mr. C. H. G. Hannam, Mr. A. G. Kellogg, Mr. Miedbrodt, and others.

Mr. Cunningham, in the course of the evening, spoke to the following effect:—

It was some eight years, ago that I visited Dairen for the first time. The wonderful growth of this port made during these eight years has impressed me profoundly. The establishment of the British Chamber of Commerce at Dairen is for the protection and furtherance of the British commercial interests and also for the safeguarding of the mutual good with the Japanese. The courtesies shown by the Kwantung Government, the South Manchuria Railway Company, and the Representatives of the local economic circle are heartily appreciated. We may

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look for the continuance of their support and sympathy in the future. By the friendly co-operation of the Japanese and British mercantile communities, the commercial development of Manchuria may be secured.

Governor Yamagata, in response, stated that the establishment of the British Chamber of Commerce at Dairen would contribute substantially toward the opening up of Manchuria and Mongolia and was most cordially welcomed. His Excellency, on behalf of the Japanese guests, wished the new Chamber every success and prosperity.

Among the after-dinner entertainments, performances by the Dairen Little Girls' Operatti Society (under the direction of Mr. Muraoka of the self same Orchestra) were exhibited at the Hotel Lounge.

CHINESE ECONOMIC CIRCLE PANIC-STRICKEN.

In South Manchuria.

On December 1st., the Dairen Branch of the Bank of Chosen received a telegram to the effect that the Kirin Provincial notes sharply dropped to 60 *tiaos* and made the dealings in gold notes on the part of the Kirin Trust & Guaranty Co. quite impossible, and that the Governor of Kirin Province prohibited the issue of Kirin Provincial notes by the Kirin Provincial Bank, ordering the treasury of the Bank to be closed.

What a baneful effect the abrupt fall of silver produced on the financial market of Manchuria may be imagined from the above telegram.

We further hear that money is extremely tight among the produce dealers and banks in the interior of Manchuria, the prospect looking still blacker.

At Yingkou (Newchwang), owing to the heavy decline of the Transfer-Money market there, four Chinese private banks had a run started on them and might go under. Since these private banks serve to the Chinese business circle as special financing mediums and perform a dual function of sending remittances and advancing loans on credit, the collapse of these banks, were it to come true at all, would seriously affect the economic Yingkou.

Even at Dairen, several Chinese merchants of good standing at Hsiaokangtzu (Chinese Quarter) have already been swept off their feet or have decamped.

Since the appearance of the reactionary sign in the economic world, prophecies

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were often made that the Silver countries would not escape the universal disaster.

It so happened that Silver, mainly through the peculiar circumstances surrounding it, managed to keep aloof from the fluctuations of the general prices and came down at a slower pace, thereby putting off the inevitable catastrophe.

The great drop of Silver took place, just when money had become more stringent and business more depressed, casting it beyond range of practicality for the market to recompose itself. The economic market has at length had its elasticity exhausted and has thrown up many a wrecked concern. As the periodical settlement day of the Chinese at the old Chinese year end approaches, the panic threatens to be intensified.

As far as the Japanese are concerned, they have been on their guard against some such denouement and are hoped to be able to get off with comparatively light loss. Matters will prove very much worse with the Chinese businessmen on top of the prolonged dullness, and it is bound to tell upon the export trade, not to mention the import business.

WOOL QUESTION.

Sheep-Raising as Bye-Industry of Japanese Farmers.

Prior to the great War, the major portion of wool was imported from Australia and England. According to the statistics of 1914, greasy wool was imported into Japan to the amount of 8,767,000 *kin* worth ¥5,220,000, of which 7,300,000 *kin* worth ¥4,429,000 was brought from Australia. As to scoured wool, 7,087,000 *kin* valued at ¥10,076,900 was imported into Japan, 4,419,800 *kin* valued at ¥6,824,000 coming from Great Britain, and 2,414,800 *kin* valued at 3,565,600 from Australia.

On the outbreak of the great War the export of wool from Great Britain and Australia was prohibited and this was very keenly felt by Japan. Part of the vacuum thus created was filled by imports from South Africa and South America, but Japan's frightful handicap in having to depend upon foreign imports entirely for wool supply, especially in time of war, was brought home to Japan most forcibly.

It was agreed that what is absolutely necessary for the troops and railway employees should be supplied with domestic products, so as to make the Empire self supplying in this line. Thereupon, a new section named the Merino Sheep

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Section was founded in the Department of Agriculture & Commerce with sheep farms at the five places—Takigawa and Tsukisamu (Hokkaido), Tomòbe (in Ibaraki Prefecture), Hojo (in Hyogo Prefecture), and Goshi (in Kumamoto Prefecture). Tests of propagating breeding merino sheep were conducted on these farms, and they were either sold or lent to applicants. Encouragement money was awarded on certain conditions. At the same time, graduates of the Prefectural Agricultural Schools are given a training in sheep-raising, to be assigned to different Prefectures to guide and encourage sheep-raising. Plans are being carried out one by one in order to encourage this line of industry. In consequence the total of only 3,338 head of sheep in Japan at the end of March, 1917, increased to 5,573 head by the end of May, 1919, and to 8,219 by May, 1920. What were imported from abroad were 513 head in 1918 and 634 head in 1919, and the figure for 1920 was thought to reach 1,000 head.

The import of wool into Japan has been on a steady increase. Speaking of scoured wool, ¥2,548,000 *kin* valued at ¥11,000,000 rose to 3,239,000 *kin* worth ¥13,736,000, while greasy wool was imported to the respective amounts of 26,284,000 *kin* worth ¥49,141,000 and 38,532,000 *kin* worth ¥47,567,000, in 1918 and 1919, and, for the last year, 1919, up to August, to the amount of 1,600,000 *kin* worth ¥8,730,000 in scoured wool and 52,620,000 *kin* worth ¥105,000,000 in greasy wool.

Whilst the individual amounts from the different countries are unascertainable, South Africa is believed to have supplied most from the war time at least with greasy wool.

The noteworthy effect of the great war on the wool-raising industry of Japan is dual—firstly the development of manufacture of scoured wool. In the prewar times, scoured wool and greasy wool were brought into Japan in nearly equal quantities. In 1920, only 1,600,000 *kin* of scoured wool was imported with 52,000,000 *kin* of greasy wool up to August. This salutary result was obtained from the stimulus given by the failure of import from Australia and Great Britain during the war time. Secondly, it should be noted that Great Britain, Australia, North America, etc., which used to be the chief suppliers, are being outstripped by South Africa and South America.

Turning to the sheep-raising enterprise in Japan, it is still in its infancy, as

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above stated, but the Department of Agriculture & Commerce, Tokyo, has a reasonable scruple at encouraging it as other than a bye-industry. For, wool now being, so to speak, an article of world commodity, in the event of its being imported in large quantities from Australia, South Africa, etc., at cheap prices, it would deal a very serious blow to the sheep-raisers in Japan. It is fundamentally to head off any such disaster that the Department of Agriculture & Commerce adheres to the bye-industry principle.

In following this sensible principle, odds and ends of vegetables and ground nuts, grass growing on the farm boundary-ridges, etc., may be used as fodder. Then, in point of labour required, the farmers may put in what leisure moments they may find between their labour hours, and may well be contented with only a trifling profit. The Chinese breed is being raised by many private sheep-raisers in Japan. It is moderate in price, it is true, but it gives a wool of most inferior grade, and so its adoption is heartily discountenanced.

ANIMAL FAT MATERIAL OF MANCHURIA.

With the development of the fat industry in Japan after the war, the export of animal fat produced in China has increased at a bound, the annual export amount being worth ¥5,000,000, as against some ¥1,000,000 for the pre-war times, as indicated below:—

Cattle Fat Exported to Japan.

	kin	*yen*
1914	8,225,000	1,324,000
1915	7,731,000	1,326,000
1916	6,949,000	1,480,000
1917	12,710,000	3,233,000
1918	15,162,000	4,165,000
1919	12,211,000	5,214,000
1920 (up to April)	7,996,000	3,714,000

Other Animal Fat Exported to Japan.

	kin	*yen*
1914	977,000	141,000
1915	355,000	65,000
1916	115,000	29,000
1917	1,588,000	418,000
1918	1,705,000	517,000
1919	2,306,000	841,000
1920 (up to April)	1,646,000	872,000

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Of the animal fat exported to Japan, cattle fat takes the first place. What used to amount to 7,000,000-8,000,000 *kin* worth about ¥1,400,000 before the war has been raised to 12,000,000 *kin* valued at over ¥5,000,000.

The cattle fat imported into Japan during the fiscal year 1919 originated as follow :—

From	*kin*	*yen*
China	6,619,000	1,735,000
Kwantung Leased Territory	378,000	95,000
Europe	8,119,000	2,323,000

From the above, it will be seen that what goes into Japan from China in lines of animal fat material is only slightly less than that from Europe.

Animal fat material in Manchuria is found in abundance and holds out a very promising outlook. It takes the second place in all China. In 1918, only 8,000 *kin* worth ¥3,000 was exported to Japan from Manchuria, rising by leaps and by bounds up to 1,008,000 *kin* worth ¥430,000 in the fiscal year 1919.

ANALYSES OF DIFFERENT LAYERS OF FUSHUN COAL SEAM.

The analyses of the different layers of the Fushun Coal seam, as announced by the South Manchuria Railway Company's General Labouratory, Dairen, which conducted a series of technical examination over them in August, 1920, are as under :—

	Place of production	Layer	Moisture per cent	Volatile matter per cent	Fixed carbon per cent
1	Chienchinchai	Fuji	9.87	37.85	48.37
2	"	Yamato	10.75	37.94	49.39
3	"	Asahi	8.53	38.81	50.08
4	"	Tokiwa	9.58	40.55	45.04
5	"	Sakura	7.27	44.42	46.26
6	Oyama	Fuji	5.32	39.99	42.37
7	"	Yamato	6.46	39.73	50.77
8	"	Asahi	6.51	28.16	57.82
9	"	Tokiwa	7.44	35.60	50.21
10	"	Sakura	3.52	43.03	50.70
11	"	... ...	4.60	35.97	44.58
12	Laohutai	Fuji	7.44	37.94	48.33
13	"	Yamato	8.53	37.59	51.74
14	"	Asahi	9.49	33.61	48.90
15	"	Tokiwa	6.01	38.69	49.58

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	Place of production	Layer	Moisture per cent	Volatile matter per cent	Fixed carbon per cent
16	Laohutai	Sakura	6.31	39.70	51.94
17	Yangpaipu	Fuji...	7.38	38.95	47.26
18	"	Yamato	6.13	35.02	43.13
19	"	Asahi	6.49	37.05	51.18
20	"	Tokiwa	6.55	37.76	50.52
21	"	Sakura	6.00	39.16	53.08
22	Wantawu	Fuji...	6.75	36.11	46.42
23	"	Asahi	7.11	38.69	49.82
24	"	Tôkiwa	3.58	36.34	39.72
25	"	Sakura	7.36	36.72	54.13
26	Hsintun	Fuji...	6.32	36.78	50.55
27	"	Yamato	6.24	33.40	47.20
28	"	Asahi	4 05	39.67	52.71
29	"	Sakura	3.25	43.01	51.89
30	Lungfeng	Fuji...	3.93	38.35	51.64
31	"	Asahi	3.48	36.05	52.90
32	"	Sakura	3.61	42.15	36.17
33	Togo	Fuji...	5.19	37.59	52.88
34	"	Yamato	6.25	36.85	49.25
35	"	Asahi	5.84	33.96	42.90
36	"	Sakura	5.77	37.96	53.89
37	Kuchengtzu Pit 2 (unscreened)		11.96	32.01	35.39

	Characteristics of Coke	Ash	Colour of ash	Sulphur	Nitrogen
1	Caking	3.91	Grey	0.59	2.12
2	"	1.92	Yellowish	0.48	2.03
3	"	2.58	Pink	0.68	1.95
4	"	7.83	Grey	0.64	1.05
5	"	2.05	"	0.43	1.59
6	"	12.32	Purplish	1.43	2.38
7	"	3.04	Grey	0.55	2.36
8	"	7.51	"	0.53	1.53
9	"	6.75	Pink	0.80	1.24
10	"	2.75	"	0.35	1.16
11	"	14.85	"	0.69	1.10
12	"	6.29	"	0.83	2.49
13	Slightly expansive & Caking	2.14	Grey	0.42	2.40
14	Caking	7.96	"	0.48	2.00
15	"	5.72	Pink	0.55	1.00
16	"	2.05	"	0.42	1.44
17	Slightly expansive & Caking	6.41	Brownish red	1.72	2.60
18	Caking	15.72	Grey	0.51	1.94
19	"	5.28	"	0.53	1.92
20	Slightly expansive & Caking	5.17	"	0 45	1.43
21	Cohesive	1.76	"	0.50	1.38

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	Characteristics of Coke	Ash	Colour of ash	Sulphur	Nitrogen
22	Slightly expansive & Caking	10.72	Pink	0.39	2.40
23	Caking	4.83	Purplish	0.54	2.26
24	"	20.36	Dark brown	0.60	1.44
25	"	1.79	Pink	0.80	1.61
26	Caking	6.15	Grey	0.72	2.12
27	"	13.16	"	1.06	1.78
28	"	3.57	White	0.72	1.50
29	"	1.85	Yellowish	0.81	1.38
30	"	6.08	Grey	0.63	2.86
31	"	7.57	"	0.95	2.38
32	"	18.07	White	0.64	1.87
33	"	4.34	Whitish	0.70	2.55
34	"	7.65	"	0.77	1.72
35	"	17.30	Grey	0.46	1.21
36	"	2.38	Dark pink	0.45	1.48
37	Non-caking	11.64	Pink	1.37	1.27

AVERAGE STANDARDS OF LIVING.

Of Dairen Workmen.

The Second International Labour Conference is to be held at Berne, Switzerland, next Spring, and, since the problems of industrial education and sundry labour issues are certain to be discussed at the Conference, the Imperial Colonial Board, Tokyo, has requested the Kwantung Government to report on the local labour questions.

The following is an extract from a table prepared by the Dairen Civil Administration giving the average standards of living of printers, blacksmiths, and carpenters, both Japanese and Chinese:—

	Printers (Japanese)				Carpenters (Japanese)			
	Single	%	Married	%	Single	%	Married	%
Food	¥420	42	¥680	51	¥432	35	¥600	37
Clothing	70	7	72	5	72	5	180	11
Lodging or Dwelling	80	8	108	8	96	7	240	15
Heating & Lighting	20	2	90	7	24	2	120	7
Furniture	20	2	24	2	24	2	36	2
Educational expense...	—	—	36	3	—	—	30	2
Amusements & recreations ...	150	15	60	4	300	24	92	6
Sanitation	60	6	96	7	12	1	60	4
Personal expenses	50	5	72	5	60	5	60	4
Savings	130	13	106	8	300	24	200	12
		100		100		105		100

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As for the married people, their living expenses have been figured out on the supposition that their families each consists of wife and two children, 5 and 8 years of age.

	Blacksmiths (Chinese)				Carpenters (Chinese)			
	Single	%	Married	%	Single	%	Married	%
Food	¥120	23	¥130	22	¥120	19	¥180	25
Clothing	20	4	20	3	20	3	38	5
Loding or Dwelling...	36	7	144	24	36	6	144	20
Heating & Lighting	12	2	20	3	12	2	20	3
Furniture	12	2	10	2	12	2	24	3
Educational expenses	—	—	10	2	—	—	10	1
Amusements & recreations ...	96	17	60	10	60	10	100	14
Sanitation...	5	—	10	2	5	—	10	2
Personal expenses	6	—	15	2	6	—	24	3
Savings	240	44	181	30	360	57	174	28
		101		98		99		104

SOUTH MANCHURIA SUGAR REFINING CO., MUKDEN.

This Year's Beet Crops.

An official of the South Manchuria Sugar Refining Co., Mukden, made the following remark about this year's beet crops:—

The worst drought known during the last six years had prevailed till about July last, interfering with the germination of the beets. At places seed-beets had to be sown twice over. At a time the crop was feared to come out less than 50%. The harvesting started from the beginning of November created a pleasant surprise.

This year's extent of beet cultivation comprised 8,100,000 *tsubo* of land, 3,780,000 *tsubo* more than last year. This year's harvest is supposed to come up to at least some 50,000,000 *kin* as against 25,000,000 *kin* for last year. In some cases, from 3,000 to 4,000 *kin* per 180 *tsubo* was harvested, comparing not at all badly with the finest showing recorded in the United States with the yield of 4,800 *kin* per 180 *tsubo*.

The sugar percentage for this year's outputs vary according to places and circumstances, but is no less than 15-16% on an average, bearing a fair comparison with the United States, etc. How this happy result was obtained was partly due to the favourable weather conditions, there being frequent rains after the advent of

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the rainy season, but more largely through the riper experience of the beet-growers.

The fact that both soil and climate of Manchuria are well suited to beet cultivation has become well established as results of investigations. The question confronting us was how to improve the mode of cultivation and how to induce Chinese farmers along the railway to take to the cultivation of beets. As a matter of fact, improvements have been introduced steadily in the method of cultivation, whilst those concerned directly with the work have acquired greater skill.

Compared with about ¥100 ordinarily cleared on the cultivation of kaoliang, beans, and other cereals per 180 *tsubo*, the beets have brought in ¥140 on an average, and, in the finest cases, about ¥200 per 180 *tsubo*. This favourable contrast is unmistakably appealing to the calculating Chinese, and many are applying voluntarily to grow beets by contract with the Sugar Refining Company.

The Refinery has a limited producing capacity, and, unless it is enlarged extensively, the beets harvested this year are believed to answer the purpose. The Company is thinking of selecting more carefully the contract beet-growers and the land of cultivation in order that better results may be realized. It expects to increase the area of beet cultivation next year by about 5,000 *tsubo*.

EXPORT OF MANCHURIAN CEREALS TABOOED.

Wheat & Wheat Flour Excepted.

Regarding the above prohibition, Japanese Consul-General Akatsuka and other Members of the Consular Body, Mukden, in conjunction with the Chambers of Commerce, negotiated with Military-Inspector Chang-tsolin of Manchuria time and again. At the same time, Japanese Minister Obata approached the Peking Government on the same subject. In consequence, on December 16, an instruction to the following effect was received by the Dairen Customs:—

The regulations concerning the prohibition of export of cereals and flour produced in Manchuria, as announced on November 20, 1920, have been amended as under:—

a) Wheat flour may be exported abroad as hitherto.

b) As to wheat and barley, their export abroad may be permitted in such quantity as may be determined by the Provincial Governor, subject to the approval of the Finance Office, Peking.

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c) All barley, wheat, and other kinds of cereals, the sale contracts for which had been contracted before November 20, may be exported under special permission, for which applications should be presented to the Customs authorities concerned within ten days from date, accompanied with the written bargain contracts.

d) The above prohibition and restrictions are not applicable to the land-borne trade on the North Manchurian frontier. However, the export by the river waterway and by means of carts over the surfaces of the frozen rivers (as at Aigun) is prohibited.

SHIPPING NEWS.

PACIFIC WEST-BOUND CONFERENCE CHALLENGED.

The Shipping Department of the Mitsui Bussan Kaisha and the Blue Funnel Line having undertaken to carry cargo at lower rates than the existing tariff of the Pacific West-Bound Conference, the Conference, recognizing the necessity to reduce the Conference tariff from the present nautical tendency, is said to have agreed at a meeting of the representatives of the Conference at Seattle to reduce the freight on timber for export to the Orient to G.$12.50 per ton by cubic measurement. It is expected that the rates on other kinds of cargoes will also be lowered as occasions may demand.

The departure taken by Messes. Mitsuis and the Blue Funnel Line is plainly to break up the Conference tariff, and its effect is unlikely to be confined to the Pacific West-Bound Conference, but will be extended also to the Pacific East-Bound Conference.

It is possible that the above will prove a forerunner to a general competition for Pacific trade.

T. K. K. STEAMERS TO TOUCH AT DAIREN.

On Trans-Pacific Service.

The pending question of the call of some Toyo Kisen Kaisha steamers at the port of Dairen was finally decided in the affirmative. On December 6 the Head

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Office of the Dairen Kisen Kaisha received a telegram from Tokyo, informing it of the assignment of the s.s. *Siberia Maru* (11,785 tons) and the s.s. *Persia Maru*, (over 5,000 tons) on the Company's free line to call at Dairen on both outward and inward voyages on the trans-Pacific service. The same message added that, as the first steamer, the *Siberia Maru* would be sent to Dairen via Shanghai on January 5, 1921, to set sail on the ensuing 6th for Yokohama via Kobe. The port of destination for the two ships on the American side is San Francisco, and Hongkong is also included in the list of the ports of call.

It is understood that the Dairen Kisen Kaisha will act as Local Agent for both steamers to look after passenger and cargo interests.

We further hear that, in connection with the new trans-Pacific service, the Toyo Kisen Kaisha has succeeded in entering into a contract with the South Manchuria Railway Company to procure coal as bunkers on reasonable terms to the extent of some 500,000 tons a year.

OSAKA SHOSEN KAISHA SHIPS.

On American and European Lines.

The Osaka Shosen Kaisha sprang a rather pleasurable surprise on December 9 by announcing that it had just decided to make its superior steamers both on the North American and European Services touch at Dairen. The American liners belong to the 10,000 ton class and number six, being scheduled to call at Dairen twice a month. As the first steamer on the Line, the s.s. *Alabama Maru* entered Dairen on the 17th, to be followed by the second steamer *Arabia Maru* and the third steamer *Arizona Maru* to be at Dairen on January 10 and 20, 1921, respectively. The European liners are of 8,000 ton class and number six, and are to touch at Dairen once a month. The *Himalaya Maru* scheduled to put in Dairen on January 29, 1921, will be the first ship, and the s.s. *Shunko Maru* billed to arrive at Dairen on March 6 and the s.s. *Alps Maru* due at Dairen on March 29 will be the second and third ships respectively.

In the case of these steamers, too, the bunkers are to be supplied by the S. M. R. Co. at Dairen, and we hear that an understanding was concluded between the Company and the O. S. K. represented by Mr. S. Ishizaki, who

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paid a visit to Dairen on that particular errand early last December, to supply some 100,000 tons of coal a year.

On the Dairen Wharves, part of the O. S. K. European liners will be berthed on the west side of Wharf 3 and the others at Wharf 1. Bunkers will be loaded at the rate of about 2,300 tons per ship on an average, and will be loaded by lighters from the Coal Depot on Wharf 1. In order to provide against eventualities, a new coal yard with a capacity for about 3,000 tons is to be laid out on Wharf 3. Each of these steamers is to remain at her berth here only about 24 hours. The coal loading machinery ordered from abroad is due here by about March next. It may be mentioned that Moji used to be the coaling port for these steamers, and Dairen is to take the place of Moji from the new year.

In passing, the Euopean liners have Yokohama for the port of starting, and call at Kobe, Moji, Dairen, Shanghai, Hongkong, Singapore, Colombo, Port Soudan, Suez, Port Said, Marseilles, London, Antwerp, Rotterdam, and Hamburg.

The American liners have run hitherto between Hongkong and Tacoma, via Shanghai, Nagasaki, Kobe, Yokkaichi, Yokohama, Victoria and Seattle, and now Nagasaki has been eliminated in favour of the port of Dairen.

Heretofore, cargoes for Europe from Dairen, Tsingtao, Tientsin, Chefoo, etc., have had to be shipped to Shanghai by coasters for transhipment thereat.

Henceforth, goods booked for Europe from Tientsin, Chefoo, Tsingtao, etc., are expected to converge to Dairen for transhipment here because of less cost than at Shanghai. Moreover, smaller consignments, say, from 300 to 500 tons, may be loaded also on these ships. Any of the trans-Pacific steamers has an accommodation for 40 cabin and 300 steerage passengers.

Some people foresee that, with a dozen large-typed vessels on the Western lines calling at Dairen, the prices of articles imported from the West will be lowered materially.

The first O. S. K. Pacific liner *Alabama Maru*, 9,695 tons, to call at Dairen put in here at daybreak on December 17, and was berthed at Section 2, Wharf 1 at 10 a.m. She had been launched at the Mitsubishi Dockyard, Nagasaki, in September, 1920, and is equipped with the most up-to-date appointments. Her passenger accommodation consists of thirty-nine Cabin (with 13 cabins) and three hundred and thirty-six steerage passengers. She carries a crew of 113 officers and men.

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Her officers dined with a group of the local representative residents at the Yamato Hotel on the 18th. After loading 2,200 tons of coal here, she set sail on the 19th. for Japan, leaving Yokohama for America on the 27th.

DAIREN AS PORT OF CALL.

For N.Y.K. Ships on American and European Lines.

The Nippon Yusen Kaisha s.s. *Lima Maru* on the European Line, put in the port of Dairen from Shanghai on the morning of December 8 to load some 4,000 tons of wheat in addition to some consignments of Bean Oil for Messrs. Suzuki & Co. booked to Rotteream via Port Said.

Now that the call of T. K. K. steamers at Dairen has been decided upon, that of N. Y. K. ships at this port, as instanced by the *Lima Maru* and her predecessors mostly exporting Manchurian wheat, deserves congratulation, and it is to be sincerely hoped that the call of these tramp vessels will in time develop into that of regular liners.

Preparations have been completed at the Dairen Wharves to receive these T. K. K. ships which are to be berthed for the immediate purposes at Wharf 3, the new one at the west of Wharf 2 (Main Wharf). A carriage road is to be built deviating from the main thoroughfare passing along the tram-car road leading from the East Circle (in front of the Staple Produce Exchange) to the main gate to the Wharf ground, at the south of the Baggage Delivery Office straight to Wharf 3.

CABLESHIP "OKINAWA MARU."

For Construction of New Nagasaki-Dairen Cable.

The cableship *Okinawa Maru* (over 2,178 tons), painted white, of the Communications Department, Tokyo, arrived outside the Dairen Harbour early on the morning of the 12th, and at daybreak was berthed at Section 3, Wharf 1.

Expert Nonaka, of the Communications Department, Tokyo, stated to a local press representative to the following effect:—

The cableship *Okinawa Maru* is manned by twelve officers, from the master downwards, with a crew of fifty-one men, in addition to eight experts and assistants

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with twenty-one men. Besides, two Chinese students are on board in order to witness the actual cable-laying operations. In all, she carries 95 people on board.

The cableship had set sail from Nagasaki on December 6th. She encountered a squall on the way and was obliged to seek shelter near Port Hamilton. With the improvement of the weather on the third day, she resumed her voyage. The *Okinawa Maru* is assigned to undertake to lay the new cable for the distance of 330 nautical miles from Dairen.

The remainder of the work is to be taken up on the arrival of the necessary supplies ordered from the United States by a N. Y. K. steamer about the end of January, 1921. Some length of time will be required for the examination and testing of these supplies on their receipt, and the cable-laying work is likely to be resumed perhaps from early next March.

The cost needed for the laying of the new direct Nagasaki-Dairen cable line is estimated to be over ¥1,600,000. The shore lines and the incidental expenses put together, the total cost will rise over ¥2,000,000.

At present, the aggregate length of the cable lines under the jurisdiction of the Japanese Government runs above 7,000 miles, and not a day passes without something being the matter with one or two points on the cable lines. Sometimes, new lines have to be laid. All these pieces of work have to be attended to by only two cableships.

Under favourable weather, a cableship may lay the cable at the rate of about six nautical miles per hour. From this calculation, two days and a half will be sufficient to complete the construction of the first 330 nautical mile section. When it turns stormy, the cable line must be cut off, the severed end being marked with a buoy, and the cableship will have to seek shelter elsewhere.

At the request of the S. M. R. Co., the cable-ship took up the repairing of the S. M. R. Co. cable line from Dairen to South Sanshantao Island on the 17th, but on enquiry, the damage was found more serious than at first supposed. Besides, the replacement of cable line for a distance was required, but the cableship happened to carry no supply of cable line for the purpose.

On the morning of the 21st, she completed the connecting work with the shore line, at Hoshigaura, in the suburbs of Dairen, and sailed for Chosen, paying out the new cable as she progressed.

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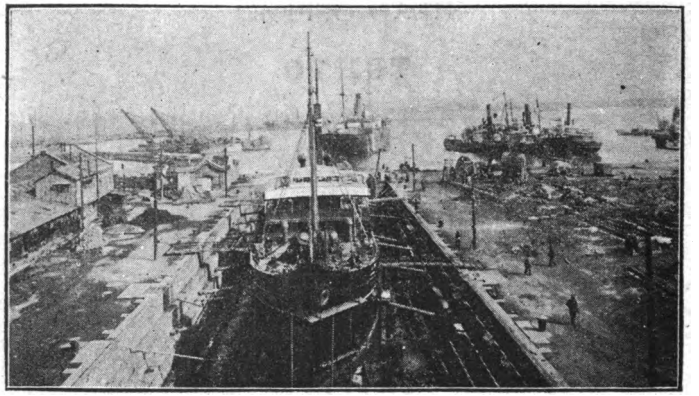

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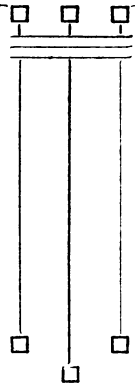

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LIGHT OF MANCHURIA

PUBLIC HYGIENE IN MANCHURIA AND MONGOLIA.

INTRODUCTION.

by Dr. M. Tsurumi.

It may be taken for granted that the public hygiene system of any country reflects the stage of progress of that country. In other words, it may be said without exaggeration that the enlightenment of a country stands proportionate to how near perfection its public hygiene system is. The genius of a correct colonizing policy lays down the public hygiene enterprise as its herald or forerunner. This is all but true, both in theory and in practice. Instances, in which this paramount consideration was more or less neglected and in which this brought the colonial ventures to pieces, have been many and need no special reiteration.

It was undoubtedly from this very consideration that, on the close of the Russo-Japanese War, when Japan took over the lease of the Kwantung Leased Territory and Baron S. Goto (now Mayor of Tokyo) assumed the first Presidency of the South Manchuria Railway Company, additionally holding the Supreme Advisership of the Government-General of Kwantung), the very first thing the far-sighted statesman did was to organize a public hygiene on approved lines even in the midst of the confusion attendant on the initiation of the great Railway Company. More than fifteen years have elapsed since, during which period both the Government-General of Kwantung and the Railway Company have had their chiefs changed several times. In the intervening time, the public hygiene system has made good progress along with the development of other activities of public nature. However, compared with the existing conditions of a like nature in Europe and America and considering the rapid advance of the times, there are still many things left to be desired in the line of improvement and extension, especially when the actual conditions obtaining in Manchuria, which is so frequently visited with epidemics of one sort or another, are noted. All these, in their very nature, brook little procrastination.

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HYGIENIC ADMINISTRATION.

All matters concerning the administration legitimately belong to the Kwantung Government (the Government-General of Kwantung till early in 1919), but the hygienic system in the South Manchuria Railway Area, together with the educational and public work systems, is included in the jurisdiction of the Railway Company. Therefore, the hygienic administration is now divided between the Kwantung Government and the South Manchuria Railway Company.

Speaking of the hygienic administration of the Kwantung Government, in the Kwantung Leased Territory, it rests in the hands of the Police Department of the Kwantung Government at the Government Headquarters at Port Arthur, and in the rest of the Leased Territory, of the Civil Administration authorities. Outside the Leased Territory and along the South Manchuria Railway Area, all affairs concerning the hygienic police are attended to by the police authorities concerned, but as regards sundry hygienic arrangements themselves, they are looked after by the Railway Company.

Turning to the hygienic system of the Railway Company, the Sanitary Office of the Local Administration Department of the Company attends to the general hygiene and manages the Company's hospitals along the railways. In the South Manchuria Railway Area, the Company's District Agencies are executing the necessary routine work, subject to the direction of the Head Office.

Hygienic experts are kept on the staff of the Sanitary Office and are stationed at such principal centres along the railways as Tashihchiao, Mukden, Changchun, Fushun, and Antung.

The Railway Area is cut up into a number of hygienic sections, and each expert has his own section assigned to him. He additionally holds the post of public physician looking after the prevention of epidemics and the preservation and improvement of public health.

At a few places like Mukden, Antung, and Yingkou (Newchwang), where there are Japanese settlements outside the Railway Area, hygienic matters are looked after by the Consular police.

As stated above, the hygienic administration system of South Manchuria is peculiarly complicated, and on this account, to keep the system at a satisfactory

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standard of efficiency, it is necessary to maintain a good mutual communication between the parties directly interested.

This necessity was recognized early and has been met as far as circumstances permitted. But, out of the desire to attain further improvement of matters, in 1918, hygienic committees were formed with officials of the South Manchuria Railway Company and the police stations at the railway centres, as decided by the Local Administration Investigation Commission of the Kwantung Government. The committee is to consider all problems of epidemic prevention and public health, and to keep one another well informed.

Next, matters concerning the quarantine and hygiene in the harbours of Dairen and Port Arthur fall under the jurisdiction of the Marine Office of the Kwantung Government, Dairen, together with those concerning the harbour and marine affairs.

HYGIENIC INVESTIGATION.

As mediums of hygienic investigations, in addition to the General Laboratory transferred to the jurisdiction of the South Manchuria Railway Company from that of the Kwantung Government, and the Isolation Hospitals at Dairen and Port Arthur, the physicians, veterinary surgeons, and pharmaceutists belonging to the Civil Administration Office and the police stations are to look after the examination of human and animal epidemics, bacteriological tests, hygienic tests of medicinal and chemical substances, foods and drinks, etc.

Again, in order to trace and investigate the pathological origins of the endemics and epidemics in Manchuria, the Endemics and Epidemics Investigation Committee was organized in October, 1913, but its activities still remain to be seen. It may be said that a committee of this nature is different from an ordinary business organization, and it would be hardly reasonable to expect a certain amount of benefit in a fixed period. However, from the very nature of its function, it is to undertake to search for and fix upon the causes of the different diseases infesting the country and to eradicate or eliminate these causes, and for this reason, incalculable good may be done in the long run, as the case has been in the European countries and the United States, most conspicuously in Germany.

Now, glancing over the prevailing conditions in Manchuria with special reference to epidemic prevention and public health, no sane person could honestly answer in the

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affirmative to the question whether or not the existing mediums for investigation of hygienic affairs would quite do. On the contrary, these mediums must be either extended or else reorganized. For instance, some such institution as a medical institute should be created.

The proper function of a medical institute is, in short, to experiment and conduct researches upon medical problems, and, at the same time, to serve as guide and counsel as regards the hygienic administration.

ABUNDANCE TEMPLE (WULIANGKUAN) VIEW I.

In consequece, in all civilized countries, such an institute is an indispensable one. The lower is the stage of progress of a country, the more keenly this indispensability seems all the more accentuated because of there being a larger number of diseases, especially dread epidemics and also endemics which are not yet known. Accordingly, the inhabitants are always menaced by these diseases, and many a life is lost before its time.

In fact, an epidemic of one kind or another is ravaging the country all the year round, and we appear hemmed in on all sides with all kinds of disease germs. Therefore, if we would get rid of such a menace and turn the land into a healthy country to live in, the study and ascertainment of the pathological origins of these diseases is a matter of vital importance.

On such a ground is based the urgent need of a medical institute in Manchuria.

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MEDICAL TREATMENT.

Mediums of medical treatment may be subdivided into those belonging to the Kwantung Government, the South Manchuria Railway Company, and the Red Cross Society of Japan.

Firstly, there is at Port Arthur the Kwantung Government Hospital under direct management of the Kwantung Government. It used to be a Red Cross Hospital under Russian regime, and, besides its architectural proportions, it is also complete in the different branches of treatment.

Next, there is an Isolation Hospital each at Dairen and Port Arthur for the accommodation of victims afflicted with any of the legally specified infectious diseases. Each is situate on a high dry locality and was constructed only in a recent year, equipped with up-to-date appointments. Apart from the able treatment of the inmates, each hospital has been performing splendid work towards contributing to the medical research.

As to the accommodating capacity, that at Port Arthur can take in 70 patients, and that at Dairen 160 at a time.

In addition, there is a women's hospital each at Dairen and Port Arthur.

The South Manchuria Railway Company maintains hospitals at

Dairen, Shahokou, Wafangtien, Tashihchiao, Yingkou (Newchwang), Anshan, Liaoyang, Mukden, Tiehling, Kaiyuan, Ssupingkai, Kungchuling Changchun, Kirin, Fushun, Penchihu, and Antung.

Those at Shahokou and Tashihchiao are the branches of the Dairen and Yingkou Hospitals respectively.

In addition, branches are kept in the Chinese cities of Yingkou, Mukden, and Changchun, for the purpose of extending the benefit of medical skill to the Chinese as our neighbours.

At Yentai Colliery, a medical station of the Fushun Colliery Hospital is kept.

Furthermore, public physicians are maintained in the South Manchuria Railway Area at Hsiungyocheng, Haicheng, Changtu, and Chikuanshan, and also at Hsinminfu, Chengchiatun, and Fakumen which three places are outside the S. M. Railway Area.

More public physicians may be stationed elsewhere as occasion may demand.

The above mentioned hospitals are on varying scales, the Dairen Hospital being the largest consisting of the nine divisions of interclinique, surgery, gynaecology, ophthalmology, dermatology, kinderclinique, rhino-laryngo-otology, dentistry, and

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laboratory which last mentioned is subdivided into bacteriological, pathological, and chemical sections, in addition to the tenth division of the Physical Treatment. Next come the Hospitals at Mukden and Fushun which have each a large accommodation. Especially, the Mukden Hospital is attached to the South Manchuria Medical College and is also separated into different divisions, each provided with the latest medical appliances, so as to put the newest medical inventions or devices to actual application, besides utilizing them for class-work at college.

At other hospitals, too, as many divisions as are deemed requisite are maintained according to the local requirements, and a due amount of consideration is expended also as to the accommodating capacity.

The following gives the numbers of beds and medical staff of each hospital, as they stood in November, 1920:—

Table "A"

	No. of beds	Chief specialists & juniors	Pharmaceutists	Mechanical experts & assistants	Clerks	Nurses & Midwives	Dormitory caretakers etc.
Dairen	450	58	14	17	37	149	3
Mukden	333	56	6	6	15	103	1
Fushun	270	23	5	11	20	66	1
Changchun	132	10	1	5	3	33	—
Antung	124	12	2	3	7	46	—
Anshan	100	10	2	7	7	20	—
Liaoyang	92	6	1	1	4	14	—
Tiehling	88	6	1	1	3	12	—
Yingkou	75	8	2	3	3	12	—
Kungchuling	53	3	1	1	2	10	—
Kaiyuan	52	3	1	1	3	6	—

	Other employees		
	Japanese.	Chinese.	Total.
Dairen	81	73	432
Mukden	37	36	260
Fushun	30	69	225
Changchun	8	15	75
Antung	6	14	90
Anshan	7	23	75
Liaoyang	3	8	37
Tiehling	3	9	35
Yingkow	4	13	45
Kungchuling	3	8	28
Kaiyuan	3	4	21

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	No. of beds.	Chief specialists & juniors.	Pharmaceutists.	Mechanical experts & assts.	Clerks.	Nurses & midwives.	Dormitory caretakers, etc.
Ssupingkai	50	4	1	1	2	7	—
Wafangtien ...	40	3	1	1	2	9	—
Penchihu	40	3	1	2	3	8	—
Kirin	28	2	1	—	2	4	—
Tashihchiao ...	23	2	1	—	2	4	—
Shahokou	20	4	1	2	3	10	—
Total	1,962	213	42	62	118	513	5

	Other employees		
	Japanese.	Chinese.	Total.
Ssupingkai	1	5	21
Wafangtien	3	3	23
Penchihu	2	6	25
Kirin	1	3	13
Tashihchiao	1	3	13
Shahokou	4	3	27
Total	197	295	1,445

As may be seen from the above table, the beds tatalled 1,962; the medical staffs 213; pharmaceutists and mechanical experts with assistants 104; clerks 118; and nurses and midwives 513.

The patients treated at all these hospitals during the past five years were as under:—

		1915	1916	1917	1918	1919	Total.
Dairen	Consultation patients...	220,619	232,871	258,084	297,579	319,000	1,328,153
	Inmates ...	103,909	117,843	125,743	152,963	157,704	658,162
Wafangtien	Consultation patients...	8,335	9,582	9,390	13,156	20,064	60,527
	Inmates ...	3,863	5,115	4,037	7,452	10,055	30,522
Yiugkou	Consultation patients...	24,983	27,677	29,390	38,202	46,098	166,350
	Inmates ...	14,009	15,240	15,498	15,891	16,845	77,483
Tashihchiao	Consultation patients...	6,717	6,825	15,727	16,762	17,289	63,320
	Inmates ...	1,304	2,071	3,543	6,462	6,237	19,617
Liaoyang	Consultation patients...	19,446	30,672	33,018	25,029	26,798	134,963
	Inmates ...	16,685	15,386	21,299	28,220	24,719	106,309
Mukden	Consultation patients...	78,260	105,592	126,663	129,482	141,008	581,005
	Inmates ...	57,719	68,934	75,888	74,847	83,417	360,805
Tiehling	Consultation patients...	21,813	35,656	32,471	34,214	33,777	157,931
	Inmates ...	15,099	16,130	17,128	15,623	19,011	82,991
Kaiyuan	Consultation patients...	10,116	16,239	23,688	14,445	16,041	80,529
	Inmates ...	2,220	2,068	1,024	5,879	10,371	21,562

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		1915	1916	1917	1918	1919	Total.
Kungchuling	Consultation patients...	8,625	11,766	19,224	25,172	16,545	81,332
	Inmates ...	10,625	13,469	12,703	13,671	16,525	66,992
Ssupingkai	Consultation patients...	4,774	6,981	7,669	14,697	15,819	49,940
	Inmates ...	—	—	—	1,094	9,266	10,360
Changchun	Consultation patients...	38,091	40,708	46,283	66,679	69,382	261,143
	Inmates ...	20,341	22,406	31,190	39,731	42,203	155,971
Penchihu	Consultation patients...	14,248	16,119	15,270	13,777	14,312	73,761
	Inmates ...	5,200	7,424	8,041	9,286	9,665	39,616
Antung	Consultation patients...	55,485	63,511	79,036	95,220	92,803	386,055
	Inmates ...	28,654	32,539	40,491	44,464	40,606	186,754
Kirin	Consultation patients...	5,342	8,547	10,202	11,810	11,452	47,353
	Inmates ...	1,779	3,045	2,711	3,974	3,785	15,294
Fushun	Consultation patients...	208,004	214,290	242,898	285,572	279,188	1,229,952
	Inmates ...	61,632	64,413	79,017	86,034	88,825	379,921
Anshan	Consultation patients...	—	—	—	—	35,737	35,737
	Inmates ...	—	—	—	—	5,666	5,666
Total	Consultation patients...	724,893	827,036	949,013	1,081,796	1,155,313	4,738,051
	Inmates ...	343,039	386,083	438,313	505,591	544,999	2,218,025

As may be seen from the above table, both consultation patients and inmates have been increasing in number year after year.

The outlays have been as follow:—

	1917	1918	1919
Dairen (Main)	¥ 369,485	¥ 343,609	¥ 436,034
„ (Branch)	—	147,804	218,117
Shahokou	18,268	37,324	49,734
Wafangtien	11,007	20,549	32,997
Tashihchiao	9,469	15,453	21,737
Yingkou	41,864	49,650	66,931
Anshan	—	—	28,485
Liaoyang	42,202	56,886	70,470
Tiehling	37,074	35,424	55,613
Kaiyuan	10,225	17,028	38,086
Ssupingkai	4,520	10,419	31,523
Kungchuling	26,134	30,806	47,043
Changchun	79,034	116,352	148,897
Fushun	183,300	250,473	214,615
Penchihu	20,750	24,970	31,552
Antung	99,540	119,555	168,845
Kirin	9,617	13,945	17,751
Mukden...	194,020	215,959	335,792
Total receipts	1,156,515	1,285,738	2,014,030
Total outlays	1,306,556	1,705,473	2,921,000
Deficit	150,041	419,734	906,970

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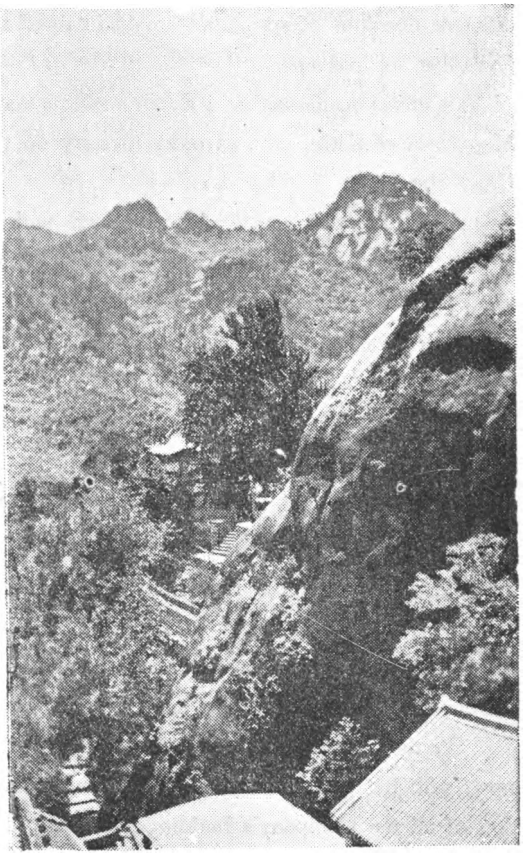
As may be seen from the above, in the fiscal year 1917, the receipts totalled about ¥1,156,000 as against the total outlays of about ¥1,306,000, leaving a deficit of ¥150,041; in the fiscal year 1918, the deficit increased to about ¥419,000; and in the fiscal year 1919, it further increased to about ¥906,000.

This increase was caused because, while the prices advanced considerably in the period mentioned, the pays and allowances of the Hospital staffs and employees were increased, notwithstanding the prices of medicines, together with the consultation and visiting fees, and other charges were maintained stationary.

Attention might be called to what heavy sacrifices the South Manchuria Railway Company has been willing to pay for the maintenance of its hospitals.

The Railway Company's Management, wide awake to the burning cry of the rapidly moving times, has decided to complete the rest of the new Hospital plan on the extensive site just south of the S. M. R. Co. General Offices at the estimated cost of about ¥3,000,000, extending over three years from the new fiscal year 1921. Besides, the reconstruction of the hospitals at several centres along the Railways is planned, and further, should necessity arise, new hospitals will be erected even at places outside the South Manchuria Railway Area. In going to such an extent, the Company's Management stands absolutely aloof from all business considerations and is actuated solely by the sincere desire



ABUNDANCE TEMPLE (WULIANGKUAN) VIEW 2.
The tall tree in the centre is Gingko Biola.

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to minister to the sore needs of all the inhabitants in Manchuria, inclusive of all nationals so as to contribute to the cause of humanity.

In addition to the hospitals under management of the South Manchuria Railway Company, there is within the walls of Mukden, the hospital of the Red Cross Society of Japan. The Hospital buildings were newly constructed, and different divisions of specialties are maintained as at the Dairen and Mukden and a few other institutions.

In addition, altogether a dozen medical stations are kept in South and North Manchuria at Kirin, etc., in order to carry on the fundamental function of the Red Cross Society.

Apart from the medical institutions under management of the Kwantung Government, the South Manchuria Railway Company, and the Red Cross Society of Japan, a large number of hospitals and medical stations under private management exist at Dairen, Mukden, Antung, Changchun, and other important centres.

At Dairen alone, the medical practitioners number thirty.

EPIDEMIC PREVENTION.

The marine quarantine in the Kwantung Leased Territory is looked after by the Marine Office of the Kwantung Government, while the epidemic prevention work on land is undertaken by the Civil Administration authorities. Victims of the legally specified infectious diseases are, as a rule, accommodated at a quarantine station or an isolation hospital under Government management.

On this account, the South Manchuria Railway Company, keeping itself in touch with the Government authorities concerned, has been undertaking the disinfection of all the Company's buildings, furniture, etc., the search of those found to be carriers of germs of the digestive organ, vaccination, the extermination of flies in summer, and other precautions for epidemic prevention.

In October, 1915, simultaneously with the introduction of the Special Municipal System to Dairen, the South Manchuria Railway Company has discontinued the epidemic prevention work, entrusting the same to the Dairen Municipality at Dairen, and that in the rest of the Kwantung Leased Territory to the police authorities concerned.

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Although the epidemic prevention business in the South Manchuria Railway Area outside the Kwantung Leased Territory legally falls also under the control of the police authorities, all preventive arrangements are undertaken by the Railway Company. All victims are accommodated for treatment at the hospitals and isolation houses maintained by the Railway Company, whilst all disinfection and other preventive procedures outside the pale of the executive police authority are attended to by the Company's District Agencies concerned. The expenses needed for the treatment of the patients and also epidemic prevention are defrayed from the public rates and the local administration list.

The epidemic prevention outside the Kwantung Leased Territory does not concern the Railway Company, but with the Japanese residing outside the Railway Area, but adjacently to the Railway Towns at Wafangtien, Haicheng, Penchihu, Chiaotou, Lienshankuan, and Fushun, the Railway Company has offered any of them on application to remove the night soil, etc., on payment of the public rates the same as the residents in the Railway Area, and the Railway Company has extended the facility to epidemic prevention along with the care of the victims of epidemics.

Outwardly the line seems definitely drawn between in and outside the Kwantung Leased Territory. However, whenever any epidemic of violent and malignant nature prevails, both the Kwantung Government and the South Manchuria Railway Company joined hands in the organization of an epidemic prevention system to cooperate heartily till the epidemic was stamped out. To cite a couple of instances, during the pneumonic plague in 1910-1911 and the cholera epidemic of 1919, an epidemic prevention department was formed in each case with the object of exterminating the pestilence with concentrated effort.

PUBLIC HEALTH.

(a) Water Service.

In and outside the Kwantung Leased Territory, all chief Railway Towns such as Dairen, Wafangtien, etc., are provided with waterworks. The quality of the water is examined once a month at the General Laboratory of the South Manchuria Railway Company, so far as the water services in the Leased Territory and the

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S. M. Railway Area are concerned. As to the water of the wells outside the Leased Territory, its examination is entrusted to the pharmaceutists on the staffs of the Company's Hospitals.

(b) Sewage.

The sewage system, too, is installed at the important railway towns, and at several places, the existing installations are about to be improved.

(c) Removal of Night Soil, etc.

The removal of night soil, etc., has been assumed by the Municipal authorities at Dairen and Port Arthur since the establishment of the Municipal system, but the same task and other sanitary undertakings in the Railway Area are being conducted by the Railway Company within the public rate assessment zone.

No mention is added in this connection regarding the markets, slaughter-houses, cemeteries, etc.

The public expenses defrayed during the recent three years for the towns in the South Manchuria Railway Area for the sake of public health (such as removal of night soil, street sprinkling, etc.) and also epidemic prevention (treatment of victims of infectious diseases) are as under:—

Public Sanitary List.

	FISCAL YEAR.		
	1917	1918	1919
Ordinary (for public health)	¥ 82,995	¥ 113,435	¥ 180,883
Extraordinary (for epidemic prevention)	74,988	73,865	93,778
Total	157,983	187,300	274,661

As regards the arrangements for public health, there exists a need to enlarge them. In the future, the existing facilities for visitors to the hot spring resorts will be improved, and further sanatoriums will be established anew; besides, improvements are to be gradually introduced into the parks, etc.

SCHOOL HYGIENE.

What a weighty significance is attached to school hygiene need not be enlarged upon here. The Hygienic authorities of both the Kwantung Government and the

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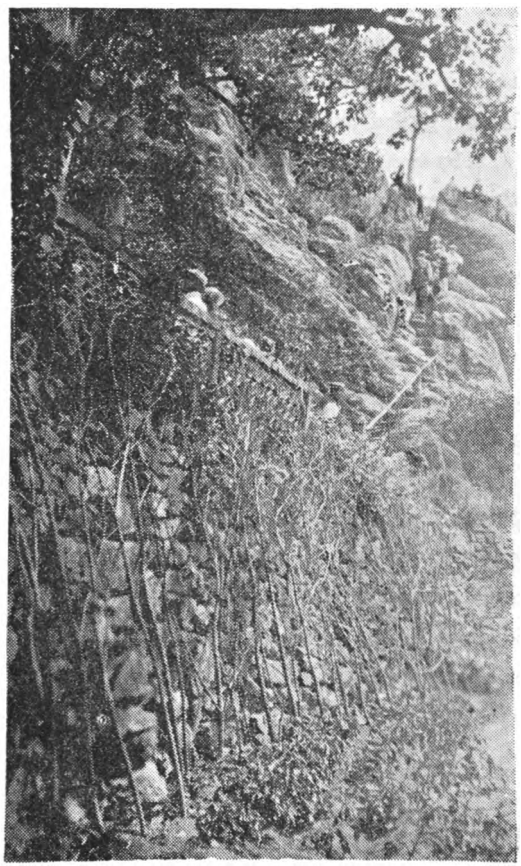
South Manchuria Railway Company took up this line of work a few years ago and have been reaping satisfactory results.

The school hygiene of the South Manchuria Railway Company may be summarized under:—

The Railway Company has appointed from one to three school physicians for each school from the staffs of the Company's hospitals according to the sizes of the schools, in order to carry on a periodical medical examination, prevention of trachoma, examination of the ears, nose, throat, and teeth. Each summer, for the sake of healthy children, seabathing is conducted about Dairen, and for the benefit of weaker pupils, school is open in the open air at the Hsiungyocheng Hot Springs, and considerable good is realized therefrom.



NEAR FIVE DISCIPLES' HEADS TEMPLE.

SOCIAL HYGIENE.

As a result of the great world war, all sociological policies have been given prominence all of a sudden. Care of babies and infants, labour hygiene, prevention of tuberculosis, etc., have been raised to themes of widening interest. Of these, some are under plan, and others have already been taken up. Especially, as to the anti-tuberculosis movement, on October 17, 1920, the inaugural meeting of the Manchuria Anti-Tuberculosis Society was held at Dairen, attended by a galaxy of medical stars of Japan including Dr. S. Kitazato (Superintendent-General of the

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Kitazato Bacteriological Institute, Tokyo. The new Society is now ready to raise a foundation fund to push forward its work steadily.

CONCLUSION.

The hygienic arrangements in South Manchuria are approaching a satisfactory stage in part, but as to the rest, it is still sadly neglected, and there are not a few things that must be taken up henceforth.

However, seen from a general point of view, the existing appointments may be said to compare favourably with those obtaining in Japan.

It may be added in this connection that, comparing Japan proper with Manchuria, quite aside from the financial side of the question, in Japan, the customs and usages are still liable to impose restraints, while in Manchuria, everything is still at an initial or inceptive stage, and on this account, there is no comparison with regard to the difficulty of carrying out novel projects or introducing new institutions.

As stated at the beginning, if any wide-awake matter-of fact person looks over the existing conditions in Manchuria with special reference to public health and epidemic prevention, he will readily agree that, for the sake of the Chinese neighbours as well as for the other inhabitants in Manchuria, and also in the cause of humanity, the extension of the present medical installations and the establishment of new institutions are to be most cordially welcomed.

FLORA OF CHIENSHAN.

By Mr. I. Oga.

"A pair of gems" in the Chinese landscape scenery are Chienshan in the east of the Liao and Lushan in the west thereof. Literally, Chienshan means "Thousand Hills" and may be approached either from Anshan (now pushed to the fore from the oblivion of a few years ago as the seat of the Anzan Iron and Steel Works) or Tangkangtzu (famous for its hot springs), both south of Liaoyang.

In South Manchuria, there is another mountain of the name of Fenghuangshan (Mt. Phoenix) which looks somewhat like Chienshan and has also many fantastic

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and picturesque views. Both mountains are covered with plants of almost endless variety, which might be called indeed rare in the midst of the vast level plains of South Manchuria relieved here and there with low hills mostly naked, or at best but thinly clad in shrubbery.

We might in this connection quote Mr. C. Kido (Superintendent of the Geological Institute of the South Manchuria Railway Company, Dairen), who is looked up to as an authority on the geological researches of Manchuria.

In passing, this gentleman comes of the finest stock in Yamaguchi Prefecture (which has produced, in a large firmament of the foremost celebrities of modern Japan, the late Prince Ito, assassinated by a Korean at Harbin Station in October, 1909, Marshal Prince Yamagata, the most eminent Elder Statesman and the most distinguished subject, and a long list of other Premiers, State Ministers, and veteran generals). Mr. Kido's father-in-law was no less a personage than the late Marquis Kido, one of the greatest central figures in the Restoration, and the present Marquis is his brother.

Seen from the distance, the lines of the Chienshan Mountains look like the teeth of a saw; seen nearer, numberless hilly cones are rising fold after fold; and when one gets into the depth of the mountains, peaks and rocks of all fantastic shapes are seen on all hands and at almost every turn, producing a scenery as varied as picturesque.

A mountain formed of granite is, as a rule, rich in natural grandeur often in the shape of precipitous cliffs, grotesque rocks, etc. That the Chienshan Mountains consist of granite may easily be inferred even by taking a glance from far. The Chienshans contain nothing but granite, and all the grand peculiarities of mountains so formed are in most conspicuous evidence.

What has fashioned the unique scenery of the Chienshan Mountains is chiefly the weathering and erosive action and also the remarkable development of joints running horizontally and vertically as is peculiar to granite. Besides, the rocky structure being of such a hard character, these joints have, in many cases, assumed the form of high perpendicular precipices often crowned or overhung with arms of varying shapes. At places, the flat even surfaces of huge rocks may seat dozens of picnickers comfortably in the cool shade of summer days.

From the depths of cleaven rocks have grown up evergreens and other trees of fanciful figures, adding much to the scenic effect of the mountains. The

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Chienshan is celebrated for their pear blossoms which in early May come out all over the hills and dales amidst the fresh greenage, turning them to a dreamland of chaste beauty and fragrance; then in late autumn, the leaves take on all shades of tints, some flaming crimson and others light brown or yellow with a hundred and one intermediate hues.

The natural charms of the Chienshans cannot of course hold a candle to those of Diamond Mountain of Chosen, although decidedly superior to those possessed by Mt. Phoenix near Fenghuangcheng on the Mukden-Antung Line.

Truly enough, the Chienshan misses waterscape, save for the petty gurgling streamlets.

Hills of granite structure generally wear a purple colour. Especially many rocks of the Chienshan are of fleshy pink and this peculiarity ought to accentuate the purplish inclination. Quite the contrary is, however, the case only because of want of vapor among the mountains.

An extensive store-house of natural beauty and grandeur like the Chienshan little attracts the callous, sordid Chinese, except that they are desecrated by the savage brigands as one of their favourite retreats. The toiling and moiling natives are after materialistic gain only.

It may be said with unfailing truth that man cannot live absolutely aloof from his natural surroundings. Nature will leave on man her unmistakable impress in some way. If the Chienshan has produced its effect on the inhabitants at all, it might be said that the saw-teeth-like ruggedness of its outlines has sawed off the warmth off their hearts, angulating them into cruelty and savagery.

What vestiges of civilization Manchuria possesses might be likened to a stale, dry husk containing only a lame excuse of almost primeval civilization. In order to develop such a civilization in an approvable manner, a sufficiency of the necessary complement in the form of spiritual and mental culture must be supplied, and it seems most appropriate that the Japanese, from their geographical proximity and racial kinship, should supply the burning want.

There are among these mountains altogether twenty-five temples of different sizes including among the rest the Lungchuan (Dragon Fountain Temple), the Wuliang (Abundance), the Hsiangyen (Fragrant Rock Temple), the Taan (Great Peace Temple), the Taiho (Peaceful Bliss Temple), etc.

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These mountains are divided into a number of ranges interspersed with glens or dales.

There are in all some one thousand peaks or cones, which may be grouped into threefold ranges as mentioned under:—

(I) Frontal Range: It takes the shape of a horse-shoe and is located nearest Anshan (the seat of the Anzan Iron & Steel Works).

a) Near Dragon Fountain Temple (龍泉寺) and Abundance Temple (無量觀) (Taoist).
b) Near South Fountain Temple (Nanchuan-an 南泉庵) (Taoist).
c) Near Blue Haze Temple (Chingyunkuan 青雲觀).
d) Near Five Disciples' Heads Temples (Wufoting 五佛頂).

(II) Middle Range:

a) Near Peaceful Bliss Temple (Taihokung 泰和宮).
b) Near Benevolence Temple (Tzuhsiangkuan 慈祥觀) (Taoist).
c) Near Five Dragon Temple (Wulungkung 五龍宮).
d) Near Muyuan Temple (木魚庵).

The above are located in the small dales between the Frontal Range and the Innermost Mountain.

(III) Innermost Mountain: It towers solitary in the rear and may be divided into the following:—

a) Near Fragrant Rock Temple (Hsiangyenssu 香岩寺).
b) Near Pure Sanctity Temple (Chingshengkung 清聖宮).
c) Near Great Peace Temple (Taanssu 大安寺) (Taoist).
d) Near Central Congregation Temple (Chunghuissu 中會寺).
e) Near Holy Recluses' Pavilion (Hsienjentai 仙人臺).

The principal groves among the clusters of hills in the Chienshan Range are situated near the Dragon Fountain Temple in the Frontal Range; near the Five Dragon Temple in the Middle Range; and near the Fragrant Rock Temple, the Great Peace Temple, the Central Congregation Temple, and Holy Recluses' Pavilion on the Innermost Mountain; from which fact the chief groves may be said to be on the Innermost Mountain.

As stated above, there are two approaches to Chienshan, one by way of Tangkangtzu whence the distance eastward to Upper Shihchiaotzu is about 7½ miles, and the other from Anshan whence one may travel by rail as far as Takushan, one of the Anshan iron mine zones, which is only a little over a mile to Upper Shihchiaotzu, the entrance to Chienshan, where the paths for the Frontal and the Middle Range and the Innermost Mountain are forked. Besides, there is a fourth

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path turning to the left from Takushan and leading to the Dragon Fountain Temple via the Blue Haze Temple.

From Upper Shihchiaotzu (the entrance to Chienshan Mountains)
to Dragon Fountain Temple, 1⅔ miles.
" to Fragrant Rock Temple, 3⅓ miles.
to Peaceful Bliss Temple, 2 miles.

UPPER SHIHCHIAOTZU TO FRAGRANT ROCK TEMPLE.

There is a Chinese police-box at Upper Shihchiaotzu where there are also a few Chinese inns. It consists of from forty to fifty houses. Plants belonging to the species of Ulmus campestris L. var. laevis Pl., Populus balsamifera L. var. Laurifolia Wesmael, Zizyphus vulgaris Lam. var. spinosus Bge, Viscum album L., etc., are found in plenty at the village.

From this point, we proceeded a little over a mile along the Chienshan River running in a rather level region with the Frontal Range of the Chienshan Mountains seen to the left and Taheikutun to the right.

The plants noticed between Upper Shihchiaotzu and the Fragrant Rock Temple at Taheikutun is as follows:—

Capsella Bursa-pastris	Nazuna
Drava nemorosa	Inunazuna
Potentila viscosa	Nebarikawarazaiko
Trigonotis peduncularis	Tabirako
Androsace saxifragaefolia	Loochoo-kozakura.
Taraxacum officinale	Tampopo
Omphalodes sericea	Keruriso
Lactuca versicolor	Kawaranigana
Glycyrrhiza pallidiflora	Nokanzo
Alepecurus equalis	Suzume-no-teppo
Clematis paniculata	Senninso
Ranunculus actis	Kimpoge
Potentilla Kleiniana	Ohebi-ichigo
Ranunculus pennsylvanicus	Kitsune-no-botan
Lamium petiolata	Hime-odorikoso
Sophora flavescens	Kurara
Syringa vulgaris	Murasaki-hashidoi
Dictamus albus	Hakusen
Zelkova Davidii	Harigeyaki
Crataegus pinnatifida	Sanzashi
Prunus humilis	Koniwa-zakura
Lactuca sonchifolia	Inu-yakushisa

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Sileve-apica	Kefushiguro
Rosa davurica	Yamahamanasu
Cerastium pilosum	Miminagusa
Antennaria steetziana	No-usuyukiso
Geum strictum	O-daikonso
Artemisia vulgaris	Yomogi
Menispermum dahuricum	Hasu-no-hakazura
Mazus stachydifolius	Tachi-sagigoke
Cynanchum atratum	Funabaraso
Scutellaria indica	Tatsunamiso
Polygonum officinale	Amadokoro
Cladrastis amurensis	Inu-yenju
Bothoriosperum secundum	O-hanaibana
Acanthopanax sessirifolius	Manshu-ukogi
Chelidoneum majus	Kusano-o
Thalaspi arvense	Gumbai-nazuna
Valeriana officinalis	Kanokoso
Onoclea sensibilis	Koya-warabi
Equisetum arvense	Tokusa
Selaginella Rossii	Hariganehiba
Diarrhena manshurica	O-tatsuno-hige
Festuca gigantea	To-toboshigara
Imperata arundinacea	Chigaya
Themeda trianda var. major subvar. japonica	Me-karukaya
Carex japonica	Higokusa
Commelinc Communis	Tsurukusa
Allium tennissimum	Himenira
Asparagus schoberioides	Kijikakushi
Hemellocaris flava	Wasuregusa
Dioscorea batatas	Yamanoimo
Iris laevigata	Nejiayame
Spiranthes australis	Nejibana
Humulus japonicus	Kanamugura
Viscum album	Yadorigi
Aristolochia contorta	Kouma-no-suzukusa
Polygonum aviculare	Michiyanagi
Polygonum divaricatum	Kobano-iwatade
Rumex acetosa	Suwiba
Chenopodium album	Akaza
Dianthus superbus	Kawara-nadeshiko
Gypsaphila oldhamiana	Kogome-nadeshiko
Clematis augustifolia	Hosoba-shirokusa-Botan
Ranunculus sceleratus	Tagarashi
Thalictrum minus	Karamatsuso
Menispermum dauricum	Komori-kazura
Dontostemon dentatus	Hanahatazao
Lepidium micranthum	Hime-gumbai-nazuna
Agrimonia pilosa	Yezo-kinmizuhiki

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Potentilla discolor	Tsuchiguri
Sanguisorrba officinalis	Waremoko
Astragarus dauricus	Murasaki-utsugi
Crotaria sessiliflora	Tanuki-mame
Falcata japonica	Yabumame
Oxalis corniculata	Katabami
Xanthophyllum schinifolium	Inu-zansho
Polygala tenuifolia	Hosoba-hime-hagi
Euphorbia Helioscopia	Todai-gusa
Zizyphus vulgaris var. spinosus	Sanebuto-natsume
Hypericum Ascyron	Tomoyeso
Cnidium monnieri	Jashoshi
Lysimachia clethroides	Oka-toranoo
Swertia chivensis	Semburi
Cuscuta japonica	Nenashi-kazura
Leonurus macranthus	Kisewata
Hyocyamus niger	Hiyosu
Chamaesarcha japonica	Igahozuki
Melampyrum roseum	Tushima-mamakona
Plantago major	Obako
Rubia cordifolia	Akane
Aster holophyllus	Hosoba-yomena
Asteromaera indica	Yomena
Bidens tripartida	Taukogi
Lactuca squarrosa	Akino-nogeshi

The flora of the level zone of the mountain foot begins to partake materially of that of a forest zone as one enters into the dales at about Taheikutun.

Turning to the left from Taheikutun, the Peaceful Bliss Temple of the Middle Range may be reached. On both sides of this path, there is an abundance of pear trees. It is said that the twenty-five temples in the Mountains solely depend upon the pear fruits for subsistence. Pear trees cluster most thickly about the temples and small rills are seen threading their ways along the ravines, presenting a unique scenery unseen along the South Manchuria Railway lines.

The plants gathered about this locality are as under:—

Paris quadrifolia	Tsukubaneso
Polygonatum sibiricum	Kagi-kurumabana-rakoyasi
Cardamine dasyloba	Konronso
Populus tremula	Hakoyanagi
Dianthus chinensis	Kawara-nadeshiko
Lamium petiolata	Odorikoso
Trifolium Lupinaster	Shajikuso
Pteridium aquilinum	Warabi
Potentilla anserina	Yezotsuru-Kimbai

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Stellaria aquatica	Ushi-Hakobe
Rhamnus dauricus	Kuro-tsubara
Acanthopanax sessiriflius	Manshu-ukogi
Philadelphus tenuifolius	Hime-baikwa-utsugi
Achillea ptarmicoides	Shirobana-nokogiriso
Corydalis raddeana	Tsuru-kikeman
Aristolochia contorta	Koumanosuzukusa
Schizandra chinensis	Chosen-gomishi
Deutzia glabarata	Chosen-utsugi
Deutiza grandiflora	Iwa-utsugi
Lilium tigrinum	Oni-yuri
Orychophragmus sonchifolius	Hana-daikon
Ampleopsis heterophylla	Nobudo
Smilacina japonica	Yukizasa
Acer mandschuricum	Itayakayede
Athyrium filix-faemina	Meshida
Polypodium lineare	Nokishinobu
Scolopendrium sibiricum	Kumonosu-shida
Woodsia polysticoides	Iwadenda
Arisaema serratum var. japonica	Tennansho
Lilium concolor var. Buschianum	Himeyuri
Lilium Hansoni	Kurumayuri
Alnus japonica	Hannoki
Corylus heterophylla	Hashibami
Quercus dentata	Kashiwa
Zelkova acuminata form. keaki	Keyaki
Morus alba	Kuwa
Cucubalus baccifer var. japonica	Namban-hakobe
Silene aprica	Kefushiguro
Polygonum faurieri	Kogometade
Aconitum Fischeri	Torikabuto
Clematis fusca var. Manshurica	Kurobana-hansho-zuru
Clematis recta var. Manshurica	Tachisenninso
Thalictrum simplex	Nokaramatsu
Arabis pendula	Yezo-hatazao
Sedum sarmentosum	Tsuru-mannengusa
Philadelphus pekinensis	Pekin-baikwa-utsugi
Deutzia parviflora	Tau-utsugi
Lysimachia vulgaris	Kusaredama
Bothoriospermum secundum	O-hanaibana
Mentha arvensis	Hakka
Glechoma hederacea	Kakidoshi

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Plectranthus inflexus	Yama-hakka
Pedicularis respinata	Shiogamagiku
Veronica sibirica	Kugaiso
Galium boreale	Kinutaso
Lonicera Maackii	Maniaoshu
Lonicera vesicaria	Tsukinuki modoki
Sambucus racemosa	Niwatoko
Campanula glomerata	Yatsushiroso
Polysticum craspedosorum	Tsurudenda
Struthiopteris germanica	Kusasotetsu
Milium effusus	Ibukinukagi
Carex stenantha	Iwasuge
Hemerocallis minor	Kisuge
Funkia ovata var. minor	Giboshi
Lilium tigrinum	Oniyuri
Polygonatum officinale	Naruko-yuri
Veratrum nigrum	Shuroso
Dioscorea quinqueloba	Kikubadokoro
Spiranthes australis	Nejibana
Corylus rostrata var. Manshurica	Otsuno-hashibami
Celtis Bungeana	Yezo-yenoki
Ulmus montana	Ohiyo
Zelkova Davidi	Harigeyaki
Acomitum Anthora	Kibanatorikabuto
Berberis sinensis	Taumegi
Polygonum senticosum	Mamakonoshirinugui
Sedum Kamczaticum	Kirinso
Astilbe chinensis var. Davidii	Ochidakesashi
Micromelus alnifolia	Abukinashi
Prunus tomentosa	Yuzuraume
Rosa multiflora	Noibara
Sorbaria sorbifolia var. glabra	Yezo-nanakamado
Indigofera Kirilovi	Korai-niwafuji
Lathyrus Davidi	Itachisasage
Lespedeza bicolor	Hagi
Pueraria Thunbergiana	Kuzu
Securinega fluggeoides	Hitotsuba-hagi
Enonymus alatus	Nishikigi
Acer Ginnala	Karakogikayede
Impatiens notitangere	Kitsurifune
Tilia amurensis	Shinanoki
Actinidia arguta	Sarunashi

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Viola acuminata	Yezo-tachitsubo sumire
Cicuta virosa	Dokuzeri
Sanicula elata	Umano-mitsuba
Ajuga multiflora	Rurikakoso

Plants about Fragrant Rock Temple.

The Fragrant Rock Temple is situated in the dale west of the Innermost Mountain. There are several huge towers, one of which is a conspicuous landmark visible from Upper Shihchiaotzu in the distance. The plants in this locality include the following:—

Humulus japonicus	Kanamugura
Taraxacum officinale	Tampopo
Commerina communis	Boshibana
Galium boreale	Yayemugura
Orynchophragmus sonchifolius	Hanadaikon
Lamium petiolata	Odorikoso
Lycopus Maackianus	Koshirone
Parthenocissus tricuspidata	Tsuta
Lactuca sonchifolia	Inu-yakushiso
Rumex Acetosa	Suwiba
Chelidoneum majus	Kusa-no-o
Artemisia vulgaris	Yomogi
Thalapsi arvense	Gumbai-nazuna
Prunus tomentosa	Yuzura-ume
Geranium nepalense	Tachifuro
Potentilla viscosa	Nebari-kawara-zaiko
Prunus Persica	Momo
Sedum Kamczaticum	Kirinso
Deutzia grandiflora	Iwautsugi
Indigofera Kirilowi	Korai-kasafuji
Sedum arboroseum	Benkeiso.
Silene aprica	Kyoshiguro
Thalictrum minus	Karamatsuso
Tilia mandshurica	Oba-shinanoki
Atractylis obata	Okera
Rubia cordifolia	Akane
Fraxinus rhynchophylla	O-toneriko
Lespedeza bicolor	Hagi
Platycodon grandiflorus	Kikyo
Clasdrastis amurensis	Inu-yenju
Polygonatum latifolium	Naruko-yuri
Polygonatum officinale	Amadokoro
Sedum sarmentosum	Ono-mannengusa
Arctium Lappa	Gobo
Potentilla discolor	Tsuchiguri

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Malus baccata	Zumi
Mentha arvensis	Hakka
Securinega fluggeoides	Hitotsuba-hagi
Ajuga multiflora	Ruri-kakoso.
Iris sp.	Ki-ayame
Athyrium nipponicum	Inu-warabi
Nephrodium Thelipteris	Hime-shida
Selaginella involvens	Iwa-hiba
Polygonatum Periballanthus	Waniguchiso
Scilla chinensis	Totsutsurubo
Juglans mandshurica	Yamagurumi
Betula chinensis	Tokamba
Quercus aliena	Naragashiwa
Celtis koraiensis	Oba-yenoki
Stellaria aquatica	Ushi-hakobe
Actea spicata var. nigra	Ruiyoshoma
Clematis heracleifolia	Okusa-botan
Paeonia albiflora	Shakuyaku
Corydallis pallida	Kikeman
Lepidium latifolium	Benkei-nazuna
Sedum arboroseum	Benkeiso
Chrysosplenium flagelliferum	Tsuru-nekonomeso
Philadelphus Schrenki	Hime-baikwa-utsugi
Rubus crataegifolius	Kuma-ichigo
Desmodium Oldhami	Fuji-kanzo
Gleditschia japonica	Saikachi
Enonymus europaea var. Hamiltoniana	Mayumi
Vitis amurensis	Yama-budo
Alangium platanifolium	Urinoki
Acanthopanax sessiliflorus	Manshu-ukogi
Buplenium falcatum	Mishimasaiko
Rhododendron micrantum	Kogome-tsutsuji
Brunella vulgaris	Utsubo-gusa
Lophanthus rugosus	Kawamidori
Orobanche coerulescens	Hama-utsubo
Diervilla florida	Karatani-utsugi
Patrinia rupestris	Iwa-ominayeshi
Adenophora verticillata	Nakaba-shajin
Campanula punctata	Hotar-bukuro
Artemisia capillaris	Kawarayomogi
Aster scaber	Shirayamagiku
Callistephus chinensis	Yezogiku
Gerbera anandria	Sembonyari

In passing, in the ground of the Fragrant Rock Temple there stand several large specimens of Syringa oblata and Pinus funebris with a grove of the latter in the immediate neighbourhood.

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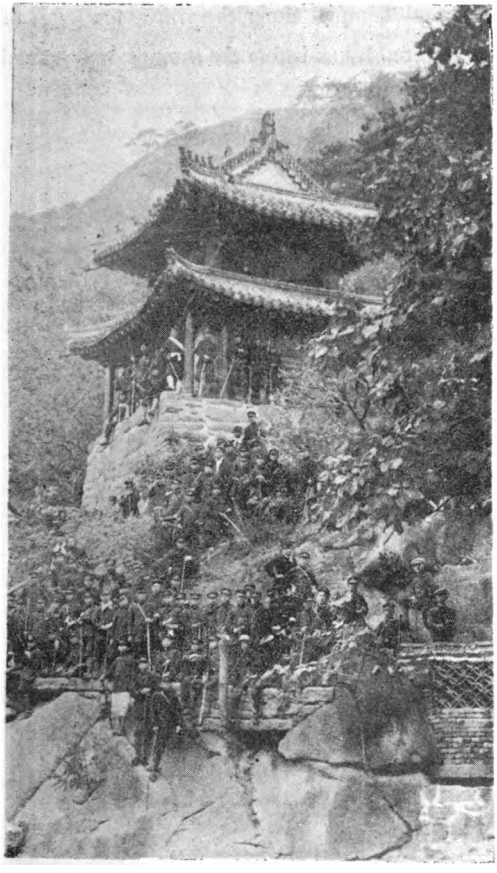

DRAGON FOUNTAIN TEMPLE (LUNGCHUANSSU.)

Let one leave the Fragrant Rock Temple, and turning to the left, scale the summit of the hill and get down to the level tract on the other side, where the Kwannon Temple stands. Manchurian poplars are much in evidence hereabouts. As one enters the glen on turning to the left, one will come to the Chingshengkung (Pure Sanctity Temple). Go up a short distance along the rill, and then turn to the right. Then, climb the steep slope, and one will find a wood of broad-leaved linden and Mongolian oak. Leave the wood and go round the hillside about half way between foot and top of the hill, and one will find oneself on the fringe of a dense forest, in the depth of which the Ta-anssu (Great Peace Temple) is located.

The plants about the Pure Sanctity Temple are as follows:—

Anemone cernua	Okinagusa
Anemone chinensis	Hiroha-okinagusa
Mazus stachydifolius	Tachisagi-goke
Acoras Calamus	Shobu
Chloranthus japonicus	Hitori-shizuka
Cardamine dasyloba	Konronso
Actinidia arguta	Sarunashi
Juglans regia. var. sinensis	Kurumi
Smilacina japonica	Yukizasa
Iris sp.	Ki-ayame
Salix babylonia	Shidare-yanagi
Populus balsamifera var. [illegible]rifolia	Teriba-doroyanagi

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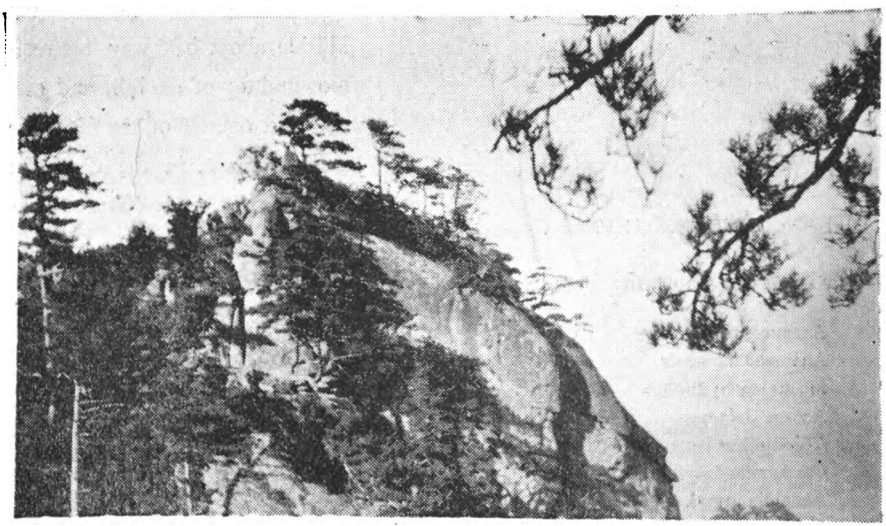
On our way from the Pure Sanctity Temple along the rill, a few eggs of water snakes were found. The plants gathered by us before the summit was gained were as follows:—

Epipactis gigantea	Suzuran
Tilia amurensis	Shinanoki
Smilacina japonica	Yukizasa
Hylomecon japonicum	Yamabukiso
Arisaema serratum	Tennansho
Philadelphus Schrenckii	Hime-baikwa-utsugi
Aralia mandschurica	Taranoki
Astilbe chinensis var. Davidii	O-chidakesashi
Galium boreale	Kinutaso
Lespedeza bicolor	Hagi
Quercus aliena	Naragashiwa
Hypericum Ascyron	Tomeyeso
Pinus funebris	Manshu-Kuromatsu
Acer truncatum	Manshu-itaya
Geranium sibiricum	Ichige-furo
Vicia pseudo-orobus f. sylvatica	Oba-kusafuji
Padus racemosa	Yezo-uwamizu-zakura
Corydalis Raddeana	Miyama-kikeman
Cimicifuga daurica	Sarashina-shoma
Krascheninnikovia Davidi	Tsuru-wachigai
Castanea sativa	Kuri



A VIEW OF CHIENSHAN

We then got out of the forest and started for the Taanssu (Great Peace Temple.)

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Cardamine dasyloba	Konronso
Lathyrus Davidii	Itachi-sasage
Polygonatum latifolium	Naruko-yuri
Thalaspi arvense	Gunbai-nazuna
Menispermum dahuricum	Komori-Kazura
Pinus Manssoniana	Shina-akamatsu
Pteridium aquilinum	Warabi
Lamium petiolata	Odorikoso
Chelidoneum majus	Kusanoo
Smilacina japonica	Yukizasa
Diervilla florida	Karatani-utsugi
Galium boreale	Kinutaso
Acer mono	Itaya-kayede
Rosa multiflora	Noibara
Rosa Xanthina	Kibana-hamanasu
Funkia ovata	Giboshi
Schizandra chinensis	Chosen-gomishi
Alnus japonica	Hannoki
Euphorbia Helioscopia	Todaigusa
Geranium nepalense	Furoso
Stellaria media	Hakobe
Veratrum nigrum	Shuroso
Chenopodium album	Akaza
Scorozonera albicaulis	Yanagibabaramonjin
Cacalia aconitifolia	Ko-yaburegasa
Atractylis ovata	Okera
Artemisia japonica	Otokoyomogi
Adenocaulon bicolor var. adhaerescens	Nobuki
Patrinia scabiosaefolia	Ominayeshi
Viburnum Sargenti	Kamboku
Plectranthus glaucocalyx	Hikiokoshi
Gentiana scabra var. Buergeri	Rindo

There are flowering plants in pots, flower beds, and gardens in the ground of the Taanssu (Great Peace Temple), where the undermentioned plants were noticed :—

Syringa amurensis	Hashidoi	紫丁香
Prunus japonica	Niwaume	桃紅
Thuja orientalis	Konotegashiwa	栢樹
Rosa indica	Bara	卽月季
Rosa multiflora	Noibara	薔梅
Tradescantia virginica	Murasaki-tsuyukusa	竹蘭
Jasminum nudiflorum	Obai	迎春
Nerium odorum	Kyochikuto	柳桃
Cereus flagelliformis	Himosaboten	蛍松板
Echinopsis Decaisneanum	Ozutsu	仙人毬
Opuntia vulgaris	Hirasaboten	仙人掌

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Sedum alboroseum	Benkeiso	鳥子草
Funkia ovata	Giboshi	紫玉針
Dicentra pusilla	Komakusa	駒苞花
Aralia mandschurica	Taranoki	刺龍
Viola tricolor	Sanshiki-sumire	蝴蝶梅
Juniperus rigida	Nezu	刺柏
Osmanthus fragrans	Mokusei	桂花
Hydrangea opuloides	Gakubana	陰繡毬
Paeonia Moutan	Botan	牡丹

From Great Peace Temple to Holy Recluses' Pavilion.

Ascending the steep hill from the rear yard of the Great Peace Temple, one will strike a wood of broad-leaved linden (Tilia mandshurica) with clearings of varying areas here and there. Proceeding leftward along the ridge of the hill, gigantic rocks of fanciful shapes are seen towering high at places. Penetrating the wood again, and going onward up the precipitous slopes, the Holy Recluses' Pavilion, which forms the highest peak among the Chienshan Group, will be reached. In the dense forest, Paeonia albiflora was found scattered here and there.

About the Holy Recluses' Pavilion were found the following plants:—

Deutzia grandiflora	Iwautsugi
Rhododendron dahuricum	Yezo-murasaki-tsutsuji
Rhododendron micranthum	Kogome-tsutsuji
Syringa amurensis	Hashidoi
Prunus sp.	A kind of cherry
Fraxinus rhynchorhylla	O-toneriko
Ulmus campestris var. laevis	Harunire
Chrysanthemum sibiricum	Chosen-nogiku
Polygonum officinale	Amadokoro
Pinus funebris	Manshu-kuromatsu

There is a path leading directly down the Holy Recluses' Pavilion in the western direction to the Fragrant Rock Temple. This path runs through a thickly wooded region, which promises an excellent place to collect plants in.

Such species as were found halfway the precipitous hill slope are as under:—

Phellodendron amurense	Kihada
Tilia mandschurica	Oba-bodaiju
Schizandra chinensis	Chosen-gomishi
Populus tremula	Hakoyanagi
Sambucus racemosa	Niwatoko
Morus alba	Kuwa

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Syringa vulgaris	Murasaki hashidoi
Malus baccata	Zumi
Acer mono	Itaya-kayede
Acer truncatum	Manshu itaya

In the undergrowth in these wooded tracts, the following plants were found:

Ranunculus acris	Kimpoge
Indigofera kirilowii	Korai-kusafuji
Nasturtium pulstire	Sukashitagobo
Orynchophragmus sonchifolius	Hanadaikon
Ajuga multiflora	Rurikakoso
Glechoma hederacea	Kakidoshi
Veronica anagallis-aquatica	Kawajisa
Corydallis pallida	Miyama-kikeman
Paeonia albiflora	Shakuyaku
Berberis sinensis	Tomegi
Polygonatum Periballanthus	Waniguchiso
Convallaria majaris	Suzuran
Hylomecon japonicum	Yamabukiso
Impatiens nolitangere	Kitsurifune
Falcata japonica	Yabumame
Diervilla florida	Karatani-utsugi
Sedum Aizoon	Hime-kirinso
Krascheninnikovia Davidii	Tsuru-wachigaiso
Anemone umbosa	Mori-ichige
Chrysoplenium flagelliferum	Hime-nekonomeso
Cimicifuga daurica	Sarashina-shoma
Acanthopanax sessilifolius	Manshu-ukogi
Angelica sp.	Senkyu
Heracleum lanatum	Hana-udo
Peucedanum decursivum	Nodake
Ampleopsis heterophylla	Nobudo
Actinidia Kolomikta	Miyama-matatabi
Geranium sibiricum	Ichigefuro
Vicia japonica	Hirohakusafuji
Polysticum tripetron	Jumonji-shida
Athyrium filix-foemina	Meshida

There are charcoal ovens before the Five Dragon Temple is reached. Charcoal is being put out in a quite primitive fashion, which will interest the visitors in some way.

FLORA OR PLANTS ABOUT CENTRAL CONGREGATION TEMPLE.

There is a small temple known as the Muyuan to be come across after going over the low hill at the south of the Five Dragon Temple. This small temple is

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surrounded with pear trees. Next come down hill and get on the other side of the small hill at the south, and the wood near the Central Congregation Temple will be gained. The last mentioned Temple may be reached by going down the ravine on the east. The outlines of this large temple may be made out at a good distance through the foliage.

The plants in this neighbourhood may be said to be materially the same as above mentioned and may be reiterated under:—

Convallia majalis	Suzuran
Anthricus sylvestris	Shaku
Campanula punctata	Hotarubukuro
Astilbe chinensis var. Davidii	Ochidakesashi
Lilium Hansoni	Kuruma-yuri
Polysticum tripetron	Jujishida
Arabis pendula	Yezo-hatazao
Chloranthus japonicus	Hitori-shizuka
Syringa amurensis	Hanahashidoi
Betula chinensis	Tokamba
Acer truncatum	Manshu-itaya
Ulmus campestris var. suberosa	Kobunire
Ranunculus repens	Hahi-kimpoge
Berberis amurensis	Chosen-megi
Potentilla Anserina	Yezo-tsurukimbai
Cedrela chinensis	Chanchin
Euonymus Bungeana	Himemayumi
Acer japonicum	Hauchiwa-kayede
Rhamnus parvifolia	Iwa-kuro-umemodoki
Sanicula elata	Uma-no-mitsuba
Lysimachia barystachis	Noji-toranoo
Siphonostegia chinensis	Hiki-yomogi
Patrinia rupestris	Iwa-ominayeshi
Phyteuma japonica	Shide-shajin
Eupatrium kirilowi	Sawahiyodori

Going up in the southern direction from the Central Congregation Temple, another Buddhist temple called the Chaoyangssu (Morning Sun Temple) stands by the mountain path. There are a few grottoes with considerable depths, and one exploring them will feel water constantly dripping from the upper side.

On negotiating the steep side grown with a dense grove of trembling poplars (Populus tremula), one will get to another cave on the top, having around it clumps of Chinese pines.

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Descending the steep wooded side of the hill, one will come to the Great Peace Temple. The belt from the Central Congregation Temple to the other Temple furnishes another capital ground for gathering botanical specimens.

Plants about Dragon Fountain Temple.

The Frontal Range of the Chienshan assumes the shape of a horse-shoe. The Blue Haze Temple is on the outermost skirt, whilst the Abundance Temple, the Dragon Fountain Temple, the Five Disciples' Heads Temple, the South Fountain Temple, etc., are scattered about in the inner parts.

The immediate neighbourhoods of the Dragon Fountain Temple are particularly thickly wooded and may be held as the most favourable collection ground in the Frontal Range.

A list of some of the specimens is given under:—

Chelidoneum majus	Kusano-o
Morus alba	Kuwa
Vitis amurensis	Yamabudo
Gerbera Anandria	Sembonyari
Thuja orientaris	Konotegashiwa
Lactuca versicolor	Kawara-nigana
Securinega ramiflora	Hitotsubahagi
Crataegus pinnatifida	Sanzashi
Castanaea sativa	Kuri
Humulus japonicus	Kanamugura
Geranium sibiricum	Ichige-furo
Celtis Bungeana	Yezo-yenoki
Orychophragmus sonchifolium	Hana-daikon
Ulmus campestris var. major.	Kobu-nire
Betula chinensis	To-kamba
Scutellaria indica	Tatsunamiso
Polygonum senticosum	Mamakono-shitinugui
Rhododendron dauricum	Yezo-murasaki-tsutsuji
Urtica laetevirens	Kobano-irakusa
Allium tenuissimum	Himenira
Viburnum Sargenti	Kamboku.
Cicuta virosa	Dokuzeri
Agrimonia pilosa	Yezo-kinmizuhiki
Geum strictum	O-daikonso
Urtica divica var. angustifolia	Hosoba-irakura

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Rosa pimpinellifolia	Kibana-hamanasu
Alangium platanifolium	Urinoki
Quercus Aizoon	Naragashiwa
Arisaema japonica	Tennansho
Tilia amurensis	Shinanoki
Tilia manshurica	Oba-shinanoki
Convallaria majus	Suzuran
Aristolochia contorta	Ko-umanosuzukusa
Paeonia albiflora	Shakuyaku
Marrhubium incisum	Kogome-odorikoso
Niphobolus petiolosus	Ko-hitotsuba
Onoclea sensibilis	Koya-warabi
Scolopendrium sibiricum	Kumonosu-shida
Woodsia manshuriensis	Fukuro-shida
Anthyrium nipponicum	Inu-warabi
Poa pratensis	Nagabagusa
Polygonatum sibiricum	Kagi-kurumaba-narukoyuri
Veratrum nigrum	Shuroso
Catalpa kaempferi	Kisasage

There are a few specimens of Ginkgo biloba in the ground of the Abundance Temple, which may be the only ones of the kind in the whole of the Chienshan Mountains.

Utility of Chienshan Plants.

It appears that the woods about the Five Disciples' Heads Temple were quite dense till recent years, although only a poor trace of them is now left.

The principal kinds of trees, of which the woods in the Chienshan Mountains are composed, are as under:—

Pinus Massoniana (Chinese pine)	Shina-akamatsu
Pinus funebris (Manchurian pine)	Manshu Kuromatsu
Tilia amurensis (Broad-leaved linden)	O-shinanoki
Fraxinus rhynhophylla (Manchurian Ash)	O-toneriko
Populus tremula (Trembling Poplars)	Hakoyanagi
Quercus mongolica (Mongolian oak)	Nara-kashiwa
Quercus dentata	Kashiwa
Acer ginnala	Karaniki-kayede
Acer mono	Itaya kayede
Corylus heterophylla	Hashibami

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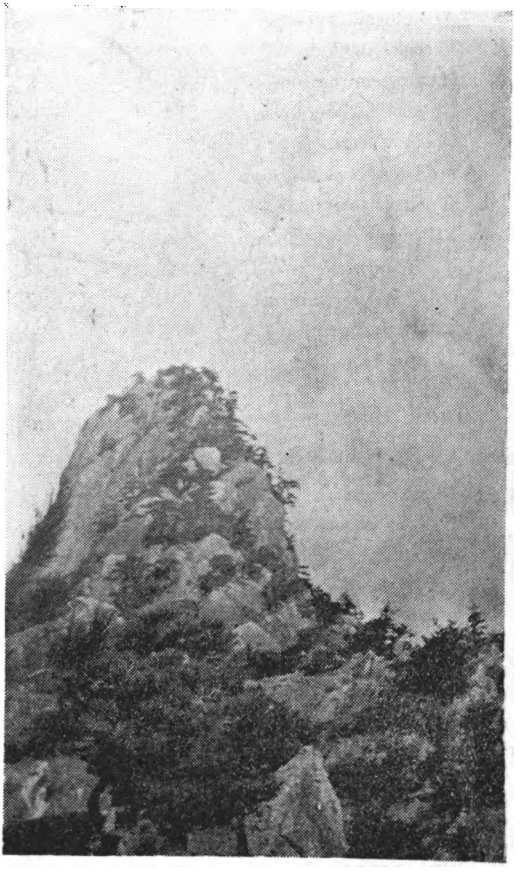
These woods have been under reckless depletion, but since nothing has been done to replenish them, they have been thinning alarmingly lately. Considering that the water of the rills flowing out of the Chienshan is feeding the water source of the waterworks of the Anzan Iron and Steel Works and the colony attached thereto, such a reckless depletion would seem to call for due attention of those holding the interests of the Anzan Works and colony at heart. Preas, Chinese hawthorn (crataegus pinnatifida), etc., are found growing almost wild, and at places they have grown to such a height and breadth that the sunlight can hardly penetrate. It is said that the pear crops of these mountains are havested every other year. The pear trees heavily laden with their golden burdens in September present a pleasant sight. There are more than a dozen varieties of pears, of which what is generally called scarlet pears, is held as the most toothsome.

The two kinds of maple trees, referred to above as Acer Ginnala and Acer Mono, are in much demand for the sake of their leaves which are manufactured into dye-stuffs.



ANOTHER VIEW OF CHIENSHAN.

It will be doing bare justice to these mountains to mention some of their plants which are good to look at. They are as under:—

Adonis verum	Fukujuso
Convallaria majaris (Lily of Valley)	Suzuran
Lilium concolor	Himeyuri
Lilium Hansoni	Kuruma-yuri

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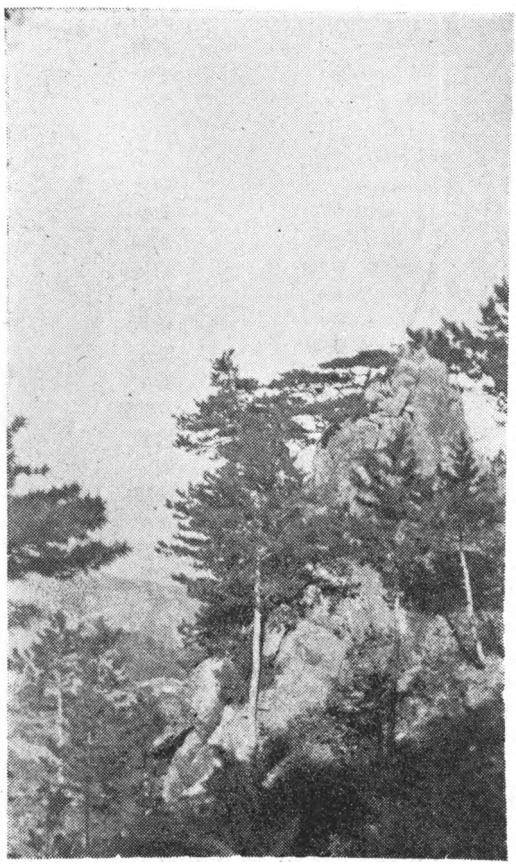
Iris sp. (Yellow-flowered-iris)	Kiayame
Paeonia albiflora (Herbaceous Paeony)	Shakuyaku
Rosa xanthina (Yellow-flowered rose)	Kibana-hamanasu
Rhododendron dauricum	Yezo-murasaki-tsutsuji

The lilacs so dear to the Western horticulturists give four-species.

Then, China aster (Callistephus chinensis) is found scattered all over the woods. The Malus baccata (Zumi) which is popularly used as stock in the grafting of apple trees is found in abundance in these mountains. The deciduous oak, on whose leaves wild silkworms are fed, is also found in plenty.



FANTASTIC ROCKS NEAR FRAGRANT ROCK TEMPKE (HSIANGYENSSU),

The phantastic and picturesque scenery of the Chienshan Mountains has no peer along the whole of the South Manchuria Railway Lines. Granite rocks and pine and other trees of all fanciful shapes or figures are found in happy and exquisite combinations in whichever direction one turns one's eyes. The dwarfish or stunted trees growing from the crevices of the rocks are often found a century or more old.

As there are no statutory laws to prevent or even restrain thoughtless tampering with the wooded growth of these Mountains, unless some adequate measures are adopted against the reckless devastation, they will eventually be denuded of their charming and even fascinating wooded garb, and they may degenerate in time into merely a ground for rearing wild silkworms and a mountain pasturage for goats, etc.

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List of Medicinal Plants, Chienshan.

Nephrodium Filix-macvar. elongatum.	Menma	貫衆
Niphobolus petiolosus.	Kohitotsuba	小石韋
Selaginella involvens.	Iwahiba	卷柏
Pinus massoniana.	Shinaakamatsu	松黃
Ginkgo biloba.	Icho	白果
Imperata arundinacea.	Chigaya	茅根
Cyperus sp.		香附子
Aisaema japonicum.	Tennansho	天南星
Acorus Calamas.	Shobu	菖蒲
Hemerocallis fulva.	Wasuregusa	萱草
Hemerocallis minor.	Kisuge	萱草
Lilium tigrinum.	Oniyuri	百合
Polygonatum officinale.	Narukoyuri	黃精
Veratrum nigrum.	Shuroso	藜蘆
Dioscorea Batatas.	Yamanoimo	薯蕷
Iris ensata.	Nejiayame	馬蘭
Juglans regia var. sinensis.	Kurumi	胡桃
Coryllus heterophylla.	Hashibami	榛
Ulmus campestris.	Harunire	榆皮
Morus alba.	Kuwa	桑皮
Viscum album.	Yadorigi	寄生
Aristolochia contorta.	Koumanosuzukusa	馬兜鈴
Polygonum aviculare.	Michiyanagi	萹蓄
Chenopodium album.	Akaza	藜
Phytolacca acinosa.	Yamagobo	商陸
Dianthus sinensis.	Kawaranadeshiko	瞿麥
Schizandra chinensis.	Chosengomishi	五味子
Cimifuga dahurica.	Sarashinashoma	升麻
Aconitum Fischerii.	Torikabuto	子頭
Aconitum Anthora.	Kibanatorikabuto	烏頭
Anemone chinensis.	Hirohaokinagusa	白頭翁
Anemone cernua.	Okinagusa	白頭翁
Chelidoneum majus.	Kusanoo	白屈菜
Lepidium micranthum.	Himegunbainazuna	葶藶子
Thlaspi arvense.	Gunbainazuna	大薺
Crataegus pinnatifida.	Sanzashi	山查
Potentilla chinensis.	Kawarazaiko	翫白草
Prunus Armeniaca.	Anzu	杏
Prunus communis.	Sumomo	李
Prunus japonica.	Niwaume	郁李
Pirus sinensis.	Nashi	梨
Pueraria Thunbergiana.	Kuzu	葛
Sophora flavescens.	Kurara	苦參
Gleditschia japonica.	Saikachi	皮皂
Astragalus dahuricus.	Murasakiougi	黃耆

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Gueldenstedtia multiflora.	Inugenge	地丁
Dictamus albus.	Hakusen	白蘚
Polygala tenuifolia.	Hosobahimehagi	遠志
Euphorbia pekinensis.	Takatoudai	大戟
Euonymus alatus.	Nishikigi	衛矛
Zyzyphus vulgalis var spinosus.	Sanebutonatsume	酸棗
Cicuta virosa.	Dokuzeri	
Aralia chinensis.	Taranoki	五加皮
Buplenum falcatum.	Mishimasaiko	柴胡
Cnidium monnieri.	Jashoshi	蛇床子
Angelica sp.	Senkyu	川芎
Angelica sp.	Touki	當歸
Peucedanum decursivum.	Shaku	與切
Siler divaricatum.	Bofu	防風
Lithospermum officinale B, erythrorhizon.	Murasaki	紫草
Leonurus sibiricus.	Mehajiki	益母草
Brunella vulgalis.	Utsubogusa	夏枯草
Lophanthus rugosus.	Kawamidori	桃草香
Lycopus lucidus.	Shirone	澤蘭
Hyosyamus niger.	Hiyosu	蒐菪
Fraxinus rhynchophylla.	Ohotoneriko	秦皮
Gentiana scabra var. Buergeri.	Rindo	龍吭
Plantago major.	Ohbako	車前
Veronica sibirica.	Kugaiso	草本威靈仙
Orobanche coerulescens.	Hamautsubo	列當
Rubia cordifolia.	Akane	茜草
Sambucus racemosus.	Niwatoko	接骨木
Valeriana officinalis.	Kanokoso	纈草
Trichosanthes kirilowi.	Kikarasuuri	王瓜
Codonopsis lanceolata.	Shajin	沙參
Platycodon grandiflorus.	Kikyo	桔梗
Adenophora verticillata.	Tsuriganeninjin	轉尼
Artemisia capillaris	Kawarayomogi	茵蔯蒿
Artemisia vulgaris.	Yomogi	祁艾
Atractylis ovata.	Okera	蒼求

List of Plants other than Medicinal, Chienshan.

Polypodiaceae. 水龍骨科		
Athyrium Filix-foemina Roth.	Meshida	
Athyrium nipponicum Diels.	Inuwarabi	
Nephrodium Filix-mas Rich, var. elongatum. Bak et moore.	Menma	綿馬.
Nephrodium Thelypteris Desv.	Himeshida	
Niphobolus petiolosus Giesenh.	Kohitotsuba	
Onoclea sensibilis L.	Koyawarabi	
Polypodium lineare Thunb.	Nokishinobu	

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Polysticum craspedosorum Diels.	Tsurudenda	
Polysticum tripteron J. Sm.	Jumonjishida	
Pteridium aquilinum Kuhn	Warabi	蕨
Scolopendrium sibiricum K.H.	Kumonosushida	
Struthiopteris germanica Willd.	Kusasotetsu	
Woodsia manshuriensis Hk.	Fukuroshida	
Woodsia polystychoides Eaton.	Iwadenda	
Equisetaceae. 木賊科		
Equisetum arvense L.	Sugina	問荊
Selaginellaceae. 卷柏科		
Selaginella involvens Spring.	Iwahiba	
Selaginella Rossii Warb.	Harıganehiba	
Gingkoaceae. 公孫樹科		
Gingko biloba L.	Icho	白果
Pinaceae. 松柏科		
Juniperus rigida L.	Nezu	刺栢、杜松
Pinus funebris Kom.	Manshukuromatsu	
Pinus Massoniana D. Don.	Shinaakamatsu	
Thuja orientalis L.	Konodekashiwa	栢樹、
Gramineae. 禾本科		
Alopecurus equalis Sobol.	Suzumenotetsupo	看麥娘
Brachypodium silvaticum Baker.*	Ohyamakamoji	
Diarrhena manshurica Maxim.	Ohtatsunohige	
Festuca gigantea vill.	Toutoboshigara	
Imperata arundinacea Cyr.	Chigaya	白茅
Milium effusum L.	Ibukinukabo	
Panicum mandshuricum Maxim.*		
Poa pratensis L.	Nagabagusa	
Poa sphondylodes Trin.*	Yamaichigotsunagi	
Setaria mauritiana Spring.*		
Themeda triandra Forsk. var. major subvar. japonica Hack.	Mekarukaya	
Cyperaceae. 莎草科.		
Carex Dineuros C. B. Clarke.*		
Carex japonica Thunb.	Higokusa	
Carex leiorhyncha C. A. Mey.*		
Carex neurocarpa Maxim.*	Mikoshigaya	
Carex pisiformis Boott.		
Carex stenantha Fr. et. Sav.	Iwasuge	
Araceae. 天南星科		
Acorus calamus L.	Shohbu	菖蒲、臭蒲
Arisaema serratum Schott. var. japonicum Bl.	Temansho	燈籠草、天南星
Commelinaceae. 鴨跖草科		
Commelina communis L.	Tsuyukusa	鴨跖草
Streptolirion volubile Edgew.	Tsurutsuyukusa	
Tradescantia virginica L.	Murasakitsuyukusa	塔竹蘭
Liliaceae. 百合科		
Allium chinense G. Don.*		

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Allium lineare L.	Chishimarakkyo	地葱
Allium tenuissimum L.	Himenira	
Asparagus schoberioides Kth.	Kijikakushi	青蕎、龍鬚菜
Convallaria majalis L.	Kimikageso	
Hemerocallis flava L.	Wasuregusa	萱草、黃花
Hemerocallis minor Mill.	Kisuge	黃花
Lilium concolor Salisb. var. Buschianum Bak.	Himeyuri	百荷草、山丹
Lilium Hansoni Leich.	Kurumayuri	
Funkia ovata Spr. var. minor Bak.	Giboshi	紫玉針
Lilium tigrinum Gawl.	Oniyuri	
Paris quadrifolia L. var. ovata Ledeb.	Kurumabatsukubaneso	百合
Polygonatum officinale All.	Amadokoro	鈴鐺菜、黃桂
Polygonatum sibiricum Red.	Kagikurumabanarukoyuri	
Polygonatum Veriballanthus Mak.	Waniguchiso	
Scilla chinensis Benth.	Tautsurubo	
Smlaina japonica A. Gray.	Yukizasa	鹿藥
Veratrum nigrum L.	Shiuroso.	綠蓮、藜蘆
Dioscoreaceae. 薯蕷科		
Dioscorea batatas Docne.	Yamanoimo	薯蕷
Dioscorea quinqueloba Thunb.	Kikubadokoro	
Iridaceae. 蕙尾科		
Iris enrata var. chinensis.	Nejiayame	馬蘭花
Iris laevigata Fisch.	Nohanashobu	
Iris sp.	Kiayame	黃花苗、蒲蘭
Orchidaceae. 蘭科		
Spiranthes australis Lindl.	Nejibana	綬草
Chloranthaceae. 金栗蘭科		
Chloranthus japonicus Sieb.	Hitorishizuka	銀線草
Juglandaceae. 胡桃科		
Juglans manshurica Maxim.	Yamagurumi	山胡桃
Juglans regia L. var. sinensis DC.	Kurumi	胡桃、核桃
Salicaceae. 柳楊科		
Populus balsamifera L. var. laurifolia Bet M.	Terihadoroyanagi	楊
Populas balsamifera L. var. Simoni Wesmael.	Shimonidoroyanagi	青楊
Populus tremula L.	Hakoyanagi	白楊
Salix babylonica L.	Shidareyanagi	柳
Betulaceae. 樺科		
Alnus japonica S. et Z.	Hannoki	曳李子、赤楊
Betula chinensis Maxim.	Toukanba	胡榛子、樺
Corylus heterophylla Fischer.	Hashibami	榛
Corylus rostrata Ait. var. B. manshurica Rgl.	Ohtsunohashibami	胡榛
Fagaceae. 山毛櫸科		
Castanea sativa Mill.	Kuri	栗
Quercus aliena Bl.	Naragashiwa	
Quercus dentata Thunb.	Kashiwa	櫟
Quercus mongolica Fischer.	Kobagashiwa	柞樹
Ulmaceae. 榆科		

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Celtis Bungeana Bl.	Yezoyenoki	
Celtis Koraiensis Nakai.	Ohbayenoki	
Ulmus campestris L. forma. suberosa.	Kobunire	楡
Ulmus campestris L. var. laevis Pl.	Harunire	楡
Ulmus montana Wither.	Ohiyou	
Ulmus pumila L.	Nonire	
Zelkova acuminata Planch. forma. keaki.	Keyaki	欅、槻
Zelkova Davidi Benth. et Hook.	Harigeyaki	山刺楡
Moraceae. 桑科		
Humulus japonicus S. et Z.	Kanamugura	葎草
Morus alba L.	Kuwa	桑
Urticaceae. 蕁麻科		
Urtica laetevirens Maxim.	Kobanoirakusa	
Urtica dioica L. var. angustifolia Ledeb.	Kirebairakusa	蝎子草(?)
Loranthaceae. 樫寄生科		
Viscum album L.	Yadorigi	槲寄生
Aristolochiaceae. 馬兜鈴科	Koumanosuzukusa	馬兜鈴
Aristolochia contorta Bge.		
Polygoneceae. 蓼科	Michiyanagi	竈竹
Polygonum aviculare L.	Kogometade	
Polygonum Fauriei Leveille.		
Polygonum divaricatum L.	Kobanoiwatade	
Polygonum dissitiflorum Hemsl.*		
Polygonum nodosum Pers.	Ooinutade	
Polygonum senticosum Fr et Sav.	Mamakonoshirinugui	
Rumex Acetosa L.	Suwiba	醋々流
Chenopodiaceae. 藜科		
Chenopodium album L.	Akaza	灰菜
Phytolaccaceae. 商陸科		
Phytolacca acinosa Roxb.*	Yamagobo	商陸
Caryophyllaceae. 石竹科		
Cerastium vulgatum L.	Miminagusa	卷耳
Cucubalus baccifer L. var, japonica Miq.	Nanbanhakobe	狗筋蔓
Dianthus superbus L.	Kawaranadeshiko	瞿麥
Gypsophila Oldhamiana Miq.	Kogomenadeshiko	
Krascheninnikovia Davidi Franch.	Tsuruwachigai	
Silene aprica Turcz.	Kefushiguro	
Stellaria aquatica Scop.	Ushihakobe	山靛、山花
Stellaria media	Hakobe	馬耳草
Manoliaceae. 木蘭科		
Schizandra chinensis Bail.	Chosengomin	北五味子
Ranunuclaceae. 毛莨科		
Aconitum Anthora L.	Kibanatorikabuto	山拉叭花
Aconitum Fischeri Reichb.	Torikabuto	烏頭
Actaea spicata L. var. nigra Willd.	Ruiyoshimauma	
Adonisverum.	Fukujuso	
Anemone cernua Thunb.	Okinagusa	毛姚呆花
Anemone chinensis Bge.	Hirohaokinagusa	毛頭花、白頭翁

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Anemone umbrosa C.A. Meyer.	Moriichige	
Cimicifuga damurica Maxim.	Sarashinashouma	
Clematis angustifolia Jacq.	Hosobashirokusabotan	
Clematis paniculata Thunb.	Senninso	大蘞
Clematis fusca Turcz. var. manshurica Rgl.	Kurobanahareyouzuru	
Clematis heracleifolia DC. B. Davidiana Fr.	Ohkusabotan	
Clematis recta L. var. manshurica Max.	Tachisenninso	
Paeonia albiflora Pall.	Shakuyaku	芍藥
Ranunculus acris L.	Kinpoge	毛茛
Ranunculus pensylvanicus L. var japonicus Maxim.	Kitsunenobotan	囘囘蒜
Ranunculus repens L.	Haikinpoge	
Ranunculus sceleratus L.	Tagarashi	石龍芮
Thalictrum minus L.	Karamatsuso	小金花
Thalictrum simplex L.	Nokaramatsu	
Berberidaceae. 小蘗科		
Berberis amurensis Rupr.	Chosenmegi	
Berberis sinensis Desf.	Taumegi	
Menispermaceae. 防己科		
Menispermum dauricum DC.	Komorikazura	丁皮葉花尖葉漢防已、黃攸香、什子黃、千金藤
Papaveraceae. 罌粟科		
Chelidoneum majus L.	Kusanoo	白屈菜、地黃連、泡黃、牛金花
Corydalis pallida Pers.	Kikeman	
Corydalis Raddeana Rgl.	Miyamakikeman	
Dicentra speciabilis (DC.) Miq.	Kemanso	荷苞花
Hylomecon japonicum Prantl.	Yamabukiso	荷青花
Cruciferae. 十字花科		
Arabis pendula L.	Yezohatazao	
Capsella Bursa-pastris Medik.	Nazuna	計記菜、薺菜
Cardamine dasyloba (Turcz) Kom.	Konronso	
Dontostemon dentatus Ledeb.	Hanahatazao	
Draba nemorosa L.	Inunazuna	
Lepidium latifolium L.	Benkeinazuna	
Lepidium micrantum Ledeb.	Himegunbainazuna	孝麻子、沙薺
Nasturtium palustre DC.	Sukashitagobo	孝麻(?)
Crychophragmus sonchifolium Bge.	Hanadaikon	山蘿蔔葉
Thlaspi arvense L.	Gunbainazuna	雀蘇拉、大薺
Crassulaceae. 景天科		
Penthorum chinense Prush.*	Takonoashi	
Sedum Aizoon L.	Yamakirinso	
Sedum alboroseum Bak.	Benkeiso	蝙子草
Sedum Kamczaticum Fisch.	Kirinso	費菜
Sedum sarmentosum Bge.	Tsurumannengusa	
Saxifragaceae. 虎耳草科		
Astilbe chinensis Franch. et Sav. var. Davidii Franch.	Ohochidakesashi	刺龍草

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Chrysosplenium flagelliferum Fr. Schmidt.	Tsuiunekonomeso	
Deutzia glabrata Kom.	Chosenutsugi	密心柳
Deutzia grandiflora Bge.	Iwautsugi	喇叭條子、鹼夾柴
Deutzia parviflora Bge.	Toutsugi	
Philadelphus Schrenki Rupr.	Himebaikwautsugi	
Philadelphus pekinensis Rupr.	Pekinbaikwautsugi	
Philadelphus tenuifolius Rupr. et Maxim.	Manshubaikwautsugi	
Rosaceae. 薔薇科		
Agrimonia pilosa Ledeb.	Ezokinmizuhiki	
Crataegus pinnatifida Bge.	Sanzashi	山楂
Crataegus pinnatifida Bge, var. Korolkovi(Rgl.)	Misanzashi	山梨紅
Geum strictum Ait.	Odaikonso	
Malus baccata Barkh. var. mandshurica Maxim.	Zumi	山梨、花紅
Micromeles alnifolia Koehne.	Azukinashi	
Padus racemosa Schneid.	Ezouwamizuzakura	
Potentilla Anserina L.	Ezotsurukinbai	
Potentilla chinensis Ser.	Kawarazaiko	醜白草
Potentilla discolor Bge.	Tsuchiguri	醜白草、夜客草
Potentilla fragerloides L. var. typica Maxim.	Kijimushiro	
Potentilla fragerloides var. Sprengeriana. Lehm.	Okijimushiro	老牛筋
Potentilla Kleiniana Wight.	Ohebiichigo	
Potentilla supina Linn.	Okijimushiro	
Potentilla viscosa Donn.	Nebarikawarazaiko	
Prunus armeniaca Linn. var. manschurica Maxim.	Anzu	杏
Prunus humilis Bge.	Koniwazakura	歐李
Prunus japonica Thunb.	Niwaume	桃紅、郁李
Prunus Persica S. et Z.	Momo	桃
Prunus tomentosa Thunb.	Yusuraume	山櫻桃、梅桃
Pyrus sinensis Lindl.	Nashi	梨
Rosa daurica Pall.	Yamahamanasu	山刺玖
Rosa indica L.	Bara	刺梅
Rosa multiflora Thunb.	Noibara	薔梅
Rosa pimpinellifolia L.	Kibanahamanasu	黃刺玖、刺梅
Rubus crataegifolius Bge.	Kumaichigo	
Rubus palmatus.	Momijiichigo	
Pubus triphyllus Thunb.	Nawashiroichigo	蕺煎田
Sanguisorba officinalis L.	Waremoko	地榆
Sorbaria sorbifolia A. Br. a. glabra Maxim.	Ezonanakamado	珍珠花
Leguminosae. 豆科		
Astragalus chinensis L. fil.	Kibanamomenzuru	
Astragalus dauricus DC.	Murasakiogi	野豆菜花
Cladrastis amurensis Benth.	Inuyenju	高麗槐、檀槐
Crotalaria sessiliflora L.	Tanukimame	
Desmodium Oldhami Oliv.	Fujikanzo	
Falcata japonica Oliv.	Yabumame	
Gleditschia japonica Miq.	Saikachi	皂莢
Glycine Soja S. et Z.	Tsurumame	藤豆花
Glycyrthiza pallidiflora Maxim.	Nokanzo	狗日花

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Indigofera Kirilovi Maxim.	Korainiwafuji	
Lathyrus Davidi Hce.	Itachisasage	
Lespedeza bicolor Turcz.	Hagi	胡枝子
Pueraria Thunbergiana Benth.	Kuzu	葛
Sophra flavescens Ait.	Kurara	苦參
Trifolium Lupinaster L.	Shajikuso	
Vicia japonica A. Gray.	Hirohakusafuji	
Vicia pseudo-Orobus F. et M. forma sylvatica.	Ohbakusafuji	
Geraniaceae. 牻牛兒科		
Geranium nepalense Sweet.	Tsuroso	老瓜筋
Geranium sibiricum L.	Ichigefuro	白毫花
Oxalidaceae. 酸漿草科		
Oxalis corniculata Linn.	Katabami	酸漿草
Rutaceae. 芸香科		
Dictamnus albus L.	Hakusen	白蘚、八卦牛
Phellodendron amurense Rupr.	Kihada	黃蘗
Xanthoxylum schinifolium S. et Z.	Inuzansho	涯椒
Simarubaceae. 苦木科		
Ailanthus glandulosa Desf.	Shinju	樗
Meliaceae. 楝科		
Cedrela chinensis Juss.	Chanchin	香椿
Polygalaceae. 遠志科		
Polygala tenuifolia Willd.	Hosobahimehagi	遠志
Euphorbiaceae. 大戟科		
Euphorbia Helioscopia L.	Todaigusa	猫眼睛
Securinega fluggeoides Muell.	Hitotsubahagi	
Securinega ramiflora Muell.*	Mehitotsubahagi	
Celastraceae. 衛矛科		
Euonymus alata Thumb.	Nishikigi	衛芽
Euonymus europaea L. var. Hamiltoniana Max.	Mayumi	明開夏合、桃葉衛矛
Euonymus Bungeana Maxim.	Himemayumi	
Aceraceae. 槭樹科		
Acer Ginnala Maxim.	Karakogikaede	山茶葉
Acer japonicum Thunb.	Itayakaede	樫樹
Acer Mono Maxim.	Manshuitaya	
Acer truncatum Bge.	Hauchiwakaede	
Balsaminaceae. 鳳仙花科		
Impatiens nolitangere Linn.	Kitsurifune	輝柔花
Rhamnaceae. 嵐李科		
Rhamnus daurica Pall.	Kurotsubara	老攸亡
Rhamnus parvifolia Bge.	Iwakuroumemodoki	
Zizyphus vulgaris Lam. var. spinosus Bge.	Sanebutonatsume	酸棗
Vitaceae. 葡萄科		
Ampelopsis heterophylla S. et Z.	Nobudo	蛇葡萄
Parthenocissus tricuspidata Pl.	Tsuta	地錦
Vitis amurensis Rupr.	Yamabudo	山葡萄
Tiliaceae. 田麻科		

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Tilia amurensis Kom.	Shinanoki	菩提樹
Tilia manshurica Rupr. et Maxim.	Ohshinanoki	椴木
Dilleniaceae. 獼猴桃科		
Actinidia arguta Pl.	Sarunashi	木天蓼
Actinidia Kolomikta Maxim.	Miyamamatabi	
Guttiferae. 金絲桃科		
Hypercium Ascyron L.	Tomoeso	傘旦花
Violaceae. 菫々菜科		
Viola acuminata Ledeb.	Ezotachitsubosumire	白花菜
Viola tricor L. (培)		蝴蝶梅
Alangiaceae. 八角楓科		
Alangium platanifolium. Harms.	Urinoki	八角楓
Araliaceae. 五加科		
Acanthopanax sessiliflorus seem.	Manshuukogi	
Aralia mandshurica Rupr. et Maxim.	Taranoki	刺龍丶
Umbelliferae. 繖形科		
Angelica sp.	Senkyu	山香葉
Anthriscus sylvestris Hoffm.	Shaku	
Bupleurum falcatum L.	Mishimasaiko	柴胡
Cicuta virosa L.	Dokuzeri	野芹菜花
Cnidium monnieri Cuss.	Jashoshi	蛇床子
Heracleum lanatum Michx.	Hanaudo	
Peucedanum decursivum Maxim.	Nodake	前胡 (?)
Sanicula elata Hamilt.	Umanomitsuba	
Siler divaricatum Benth. et. Hk.	Bofu	防風
Ericaceae.		
Rhododendron dauricum L.	Ezomurasakitsutsuji	躑躅
Rhododendron micranthum Turcz.	Kogometsutsuji	
Primulaceae. 櫻草科		
Androsarce saxifragaefolia Bge.	Ryukyukozakura	
Lysimachia barystachys Bge.	Nojitoranoo	
Lysimachia clethroides Duby.	Okatoranoo	
Lysimachia vulgaris L.	Kusaredama	楊柳花
Oleaceae. 木犀科		
Fraxinus rhynchophylla Hce.	Ohtonenko	核桃秋丶花曲柳
Jasminum nudiflorum Lindl.	Ohbai	
Syrina amurensis Rupr.	Hashidoi	白丁香
Syringa oblata Lindl.	Onihashidoi	紫丁香丶跑馬子
Syringa villosa.	Yamahashidoi	
Syringa vulgaris L.	Murasakihashidoi	紫丁香
Gentianaceae. 龍膽科		
Gentiana scabra Bge. var. Buergeri Kusn.	Rindo	龍膽
Swertia chinensis Franch.	Senburi	
Asclepiadaceae. 蘿摩科		
Cynanchum sp.		山萬拉飄
Cynanchum atratum Bge.	Funabaraso	白薇
Cynanchum sibiricum R. Br.*	Himeiyokabura	祖子花

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Apocynaceae. 爽竹桃科		
Nelium odorum Soland. (培)	Kyochikuto	夾竹桃
Convolvulaceae. 旋花科		
Cuscuta Japonica Choisy.	Nenashikazura	
Borranginaceae. 紫草科		
Bothoriospermum secundam Maxim.	Ohanaibana	
Bothoriospermum Paridiformis Max.	Tousaharuriso	
Lithospermum officinale B. Erythrorhizon Max.	Murasaki	紫草
Omphalodes sericea Max.	Keruriso	
Trigonotis peduncularis Benth.	Tabirako	藍梅
Labiatae. 唇形科		
Ajuga multiflora Bge.	Rurikakoso	
Brunella vulgaris L.	Utsubogusa	夏枯草
Lamium petiolatum Royle.	Odorikoso	山蘇子
Leonurus macranthus Max.	Kisewata	蟹菜
Leonurus sibiricus L.	Mehajiki	益母草
Lophanthus rugosus F. & Z.	Kawamidori	排草香
Mentha arvensis L.	Hakka	薄荷
Marrhubium incisum Benth.	Kogomeodorikoso	
Lycopus lucidus Turcz. B. hirtus Regel.	Shirone	澤蘭
Glechoma hederacia L.	Kakidohshi	
Plectranthus glaucalyx Max.	Hikiokoshi	
Plectrantnus inflexus Vahl.	Yamahakka	
Solanaceae. 茄科		
Hyocyamus niger L.	Hiyosu	
Chamaesaracha japonica S. & Z.	Igahohzuki	
Scrophulariaceae. 玄參科		
Mazus stachidifolius Max.	Tachisagikoke	彈力子萊
Pedicularis respinata L.	Shiogamagiku	馬尿燒
Melampyrum roseum Max.	Tsukushima-mamakona	山蘿花
Siphonostegia chinensis Benth.	Hikiyomogi	鬼麻油
Veronica Anagallis aquatica L.	Kawajisa	水苦蕒、河白菜
Veronica linearifolia Pal.	Osobatoranoo	狗尾把花
Veronica sibirica L.	Kugaiso	草本威靈仙
Bignoniceae. 紫葳科		
Catalpa Kaempferi S. & Z.	Kisasage	楸
Orobanchaceae. 列當科		
Orobanche coerulescens Steph.	Hamautsubo	靈芝
Plantaginaceae. 車前科		
Plantago major L.	Ohbako	車前
Rubiaceae. 茜茸科		
Galium Aparine L.	Yayemugura	猪殃々
Galium boreale L.	Kinutaso	野芹椒
Rubia cordifolia L.	Akane	茜草
Caprifoliaceae. 忍冬科		
Abelia biflora Turcz.*	Iwatsukubaneutsugi	六條木
Diervilla florida S. & Z.	Karataniutsugi	山海棠
Lonicera Maackii Rupr.		馬尿樹

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Lonicera visicaria Kom.	Tsuk nukimodoki	
Sambucus recemosa L.	Niwatoko	接骨木
Viburnum Sargenti Koehne.	Kanboku	
Valerianaceae. 敗習科		
Patrinia rupestris Juss.	Iwaominayeshi	
Patrinia scabioseaefolia Link.	Ominayeshi	敗醬
Valeriana officinalis L.	Kanokoso	纈草
Cucurbitaceae. 胡蘆科		
Trichosanthes kirilowi Max.	Kikarasuuri	爪蔞
Campanulaceae. 桔梗科		
Adenophora verticillata Fischer.	Nagabashiyajin	
Campanula glomerata L.	Yatsushiroso	
Campanula punctata Lam.	Hotarubukuro	山小菜
Codonopsis lanceolata B. & H.	Tsuruninjin	羊乳
Phyteuma japonica Miq.	Shideshajin	
Platycodon grandiflorus DC.	Kikyo	桔梗、喇叭花、大椀花
Compositae. 菊科		
Achillea ptarmicoides Max.	Shirobananokogiriso	
Adenocaulon bicolor Hk. var. adhaerescens Mak.	Nobuki	和尚菜
Antennaria Steetziana Turcz.	Nousuyukiso	
Arctium Lappa L.	Gobo	牛蒡
Artemisia capillaris Thunb.	Kawarayomogi	茵蔯蒿
Artemisia japonica Thunb. A. japonica Max.	Otokoyomogi	牡蒿
Artemisia vulgaris L.	Yomogi	艾蒿
Aster holophyllus Haemsi.	Hosobayomena	
Aster scaber Thunb.	Shirayamagiku	東風菜
Asteromaera indica Bl.	Yomena	
Asteromaera indica Bl. var. pinnatifida Max.	Yugagiku	
Atractylis ovata Thunb.	Okera	
Bidens tripartida L.	Taukogi	狼把草
Cacalia aconitifolia Bge.	Koyaburegasa	兎兒傘
Callistephus chinensis Nees.	Ezogiku	翠菊、江西臘
Chrysanthemum sibiricum Fisch.	Korainojigiku	
Eupatrium Kirilowi Turcz.	Sawahiyodori	
Gerbera Anandria Schulz. Bip.	Senbonyari	芋芙花、和尚頭花
Hieracium umbellatum L.	Yanagitanpopo	刺菜花
Hypochoeris grandiflora Ledeb.	Ohgonso	
Inula britanica L.	Oguruma	
Lactuca sonchifolia Deb.	Inuyakushiso	
Lactuca squarrosa Miq.	Akinonogeshi	山苦蕒
Lactuca versicolor.	Kawaranigana	鵞懶食
Picris japonica Thunb.	Kauzorina	毛連菜
Scorozonera albicaulis Bge.	Yanagibabaramonjin	
Scorozonera macrosperma Turcz.*		
Serratula atriplicifolia Benth. & Hock.	Haibaramonjin	
Taraxacum officinale L.	Tanpopo	蒲公英、婆々丁

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My Life's Elixir and Pride.

by Mr. Z. Hamamura.

The moonlight serene is the earth flooding
With an effulgence of silvery beams.
They glisten on the young plum tree budding
In a vase lovely as a poet's dreams.

From morn till eve, I've lavished my care
Daily on the plum vase, treasure of my heart.
T'was at first a mere stem, homely and bare,
And little was look'd for from its humble start.

Day by day, the plant strong and healthy grew;
The leaves came forth and became unfastened;
Many a bud followed, tight as a clew,
Till sunshine and warmt its firm clasp unloosened.

The flowers, with their round petals milk-white,
Emitted their high fragrance, sweet and chaste,
The first blooms to gladden the famished sight,
After the spell of the long wintry fast.

Not so much the beauty as the native
Nobility, pure as crystal and true
As diamond, that to the blossoms gives
A charm for a host of suitors to woo.

They are my just pride and life's elixir.
"Long may they thrive!" is my fervent prayer.
In the radiance of the bright, calm night,
With a full heart, Heaven's blessings I invite.

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CURRENT NEWS.

GOVERNORSHIP OF KIRIN PROVINCE.

Some time ago, it was privately decided to appoint Mr. Chi-yaoshan, ex-Governor of Shantung, Governor of Kirin Province, relieving Mil.-Commander Pao-kueiching of Kirin of his additional post of Governor of the same Province. The proposed appointment was endorsed by Military Inspector Chang-tsolin of Manchuria, at Mukden. Somehow the intended appointment has not been announced.

We understand that Mr. Chi thought twice of assuming charge of the Kirin Provincial Government, which has quite gained a notoriety as the most difficult to be governed, and firmly declined to accept the new appointment, and thus the proposition has been pigeonholed.

Thus, Mil.-Commander Pao continues to fill the Governor's post additionally.

MOTORING ROAD BETWEEN DAIREN AND PORT ARTHUR.

The proposed reconstruction of a motor road between Dairen and Port Arthur, has seemingly interested H. E. Governor I. Yamagata, of Kwantung. Mr. Matsumuro (Director of the Public Works Department of the Kwantung Government), himself being keenly alive to the vital necessity to reconstruct the road in question, has started the survey of the proposed coast road.

The Government authorities are planning to reconstruct the existing coast road into a well appointed motor car drive with a view to developing the villages along the road, but the new road is unlikely to be completed before the fiscal year 1922. On this account, it has been decided to apply temporary repairs to the existing central road between Dairen and Port Arthur for immediate purposes, so as to facilitate motoring traffic between the two cities.

MEANS OF COMMUNICATIONS IN OUTER MONGOLIA.

A Japanese traveller, who returned from a trip to Outer Mongolia recently, stated with regard to the existing means of communications thereabouts to the following effect:—

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It is a boundless level plain in Outer Mongolia as far as the eye can chare. There are hills, it is true, but they are all low. Neither are there large rivers. Nor are there any roads specially constructed. The tracks of camels on which people travel to and fro do duty for roads. Stage roads ramify in all directions with Kulun for centre.

Camels and ox-carts constitute the principal factors of the transportation service in Outer Mongolia. Between Kulun and Kalgan, some 100,000 head of camels and 10,000 ox-carts are said to be plying. The people engaged in the service number some 25,000. There is a stage coach service between Kulun and Kiakta, maintained by Russians and Buriats. There are also more than fifty motor cars carrying on passenger traffic between Kulun and Kalgan. Four or five days are required for a trip in a motor car between Kulun and Kalgan.

The Communications Office, Peking, is planning to extend the motor car line and also to build a railway between Kalgan and Kiakta.

SOUTH MANCHURIA RAILWAY COMPANY'S TRAFFIC RECEIPTS.

For December, 1920.

The traffic receipts of the South Manchuria Railway Company for the month of December, 1920, show that the railway passengers travelling on the Company's Manchuria Lines numbered 605,605, being a decrease by 212,085 from the corresponding month of the preceding year, with the total passenger receipts of ¥1,202,618, being a decrease by ¥320,563 from the preceding year. The freight tonnage totalled 910,956 tons, being an increase by 97,578 tons over the previous year; the freight receipts amounted to ¥5,655,387, being an increase by ¥808,243; the warehouse receipts were ¥20,345, being a remarkable decrease by ¥119,608 from the preceding year; the harbour receipts were ¥4,165 being the same as the preceding year; the miscellaneous receipts totalled ¥375,428, being a decrease by ¥46,443.

The aggregate receipts amounted to ¥7,257,943, being an increase by ¥325,794 on the same month of the previous year.

Speaking of the freights, ordinary freights carried were 520,087 tons, being an increase by 64,156 tons, which brought in ¥4,209,450, being an increase by ¥494,039; coal carried was 310,781 tons, being an increase by 25,615 tons, which

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brought in ¥1,234,668, being an increase by ¥245,502; the stocks and stores of the South Manchuria Railway Company were 80,088 tons, being an increase by 7,807 tons, which brought in ¥211,269, being an increase by ¥68,702.

THE LIAO FROZEN OVER.

At Yingkou.

The freezing-over of the Liao at Yingkou, Newchwang, usually takes place in the middle of December. In the present season, it has been decidedly much milder than customary, and the River became frozen over only as late as the morning of January 2nd, 1921, and traffic over the ice across the Liao was opened on the same date.

FINGER PRINT SYSTEM.

To be Introduced at Dairen from February.

The Kwantung Government police propose to introduce the Finger Print System as a clue to the apprehension of all refugees from the law, and held a course of lectures on the same System for three days from January 17. The Dairen police sent six men to attend the lectures. In passing, the Dairen police intend to introduce the same method from February, 1921.

CHINESE MARITIME CUSTOMS RECEIPTS FOR 1920.

Tael 49,500,000.

The Chinese Maritime Customs receipts for 1920 totalled Tael 49,500,000, being an increase by Tael 3,500,000 on the preceding year. As usual, Shanghai takes the first place with Tael 18,833,000, whilst Dairen ranks the third with Tael 4,902,700.

The figures for the principal ports for the same year are as under:—

		+increase −decrease compared with preceding year
Shanghai	Tael 18,833 000	+Tael 4,543,000
Tientsin withC hinwangtao	5,496,000	− 69.000
Dairen	4,902,000	+345,000
Hankow	3,671,000	−548,000
Canton	2,542,000	+ 70,000
Tsingtao	1,607,000	− 59,000
Antung	1,130,000	−214,000
Swatow	1,109,000	+ 60,000
Harbin	933,000	− 36,000
Elsewhere	4,380,000	−111,000
Total	49,500,000	+3,500 000

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PROPOSED OPENING OF AMERICAN CONSULATE.

At Kalgan.

As regards the proposed opening of an American Consulate at Kalgan, the Foreign Office, Peking, has asked in reply to put off the intended opening until the police service in Mongolia has been satisfactorily reoganized.

We understand that the American Minister to Peking has kept pressing suit from time to time on the ground that there are circumstances that brook no further delay.

CRIES AGAINST AMERICAN EMERGENCY TARIFF.

At Dairen.

On the afternoon of January 14, 1921, the Dairen Staple Produce Dealers' Association held a committee meeting with regard to the American Emergency Tariff after the example set by the Dairen Chamber of Commerce, passing the following resolutions :—

1. American clients shall be requested in the name of the Dairen Staple Produce Dealers' Association to use their effort towards getting the proposed Emergency Tariff withdrawn.
2. The Dairen Chamber of Commerce shall be requested to carry on a movement to approach the Foreign Office, Tokyo, to the end of getting the same Tariff withdrawn.
3. A similar requst shall be addressed to the New York Office of the South Manchuria Railway Company.

The Association, under date of January 20th, despatched to the Chairman of the Pacific Coast Trading Association, the Superintendent of the New York Products Exchange, and also Messrs. Proctor & Gamble, Cincinnati, Ohio, a telegram to the following effect:—

We should like to call your attention to the Emergency Tariff now on the tapis in the Federal Senate. The introduction of such a heavy tariff would practically mean the absolute stoppage of export of Manchurian staple produce, particularly Beans and Bean Oil. As the result, not only the Sino-American trade relations which have begun to grow recently will be crippled, but it will deal a serious blow to American industries using these staple produces of Manchuria for raw material, thereby tending to raise the general prices. Your special considera-

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tion and effort to the end of the same Tariff Bill being withdrawn are hereby solicited.

In passing, it may be added that the Dairen Chamber of Commerce, too, despatched a written request under date of the 20th to the Chambers of Commerce at Seattle, Tacoma, San Francisco, and Portland to the following effect:—

The Emergency Tariff Bill now before the Federal Senate is certain, if adopted, to produce a serious effect upon the trade in vegetable oils and oil-yielding seeds. In the name of the Dairen Chamber of Commerce, we request you to exercise your best endeavours with the object of getting the same Bill withdrawn.

S. M. R. Co. TAKES ACTION.

We understand that the Directorate of the S. M. R. Co. sent a telegraphic instruction to Mr. Y. Tamura (in charge of the Company's New York Office) in the following substance:—

The U. S. Government is to put a heavy tax upon Beans, Bean Oil, etc., to be imported into the United States at the rate of 2 cents per lb. of Beans and 20 cents per gallon on Bean Oil. The Bill is reported to have already passed the Congress. The proposed tax is exceedingly high and amounts to G.¥5.33 per 100 *kin* of Beans and G.¥7.09 per 100 *kin* of Bean Oil, corresponding to 1560% of the current price of Beans and 99% of that of Bean Oil.

In the event of the above Bill being legalized and taking effect, the trade of Manchuria with the United States will be totally shaken up, and the loss to be suffered by the Railway Company will be correspondingly enormous. You are requested to call at the Japanese Embassy at once to state the case and to enlist its assistance in preventing the passage of the same Bill, and further to take other steps for the realization of the same end.

The Foreign Office, Tokyo, will be approached by the representative of the Tokyo Branch Office.

The above message was forwarded on January 16.

DIRECT WIRELESS SERVICE.

Between Japan & New York City.

From January 10th, 1921, a wireless service has been opened between Japan and New York City, the United States, via the wireless office either at Funabashi

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at Iwaki, subject to the condition that, as regards the press cablegrams, arriving messages only be handled.

Supposing that a message is to be despatched to New York City, it will be forwarded to either medium wireless office by ordinary telegraph for transmission by wireless to the destination via Hawaii.

The time required for the transmission of a message is much shorter than by the ordinary cable line.

A message desptached from Dairen will reach the destination on the same day.

This is the first time a direct wireless line has been opened between Japan (inclusive of Dairen) and the Atlantic coasts of the United States.

PLAGUE SITUATION IN NORTH MANCHURIA.

Dr. Kunisawa's Report.

Dr. T. Kunisawa, the senior Hygienic expert of the Kwantung Government, who recently returned to Port Arthur from an inspecting tour of North Manchuria in order to look into the latest developments of the pneumonic plague prevailing therein, submitted to H. E. I. Yamagata (Governor of Kwantung) a report to the following effect:—

The plague epidemic about Manchouli, North Manchuria, on the Siberian border, has recurred each year. The present epidmic which originated at Hailar early in October, 1920, has proved rather violent, threatening to develop the pneumonic character, which is most dreaded, at any moment.

Surgeon-Col. Oda, of the Epidemic Prevention Department of the Japanese Troops to Vladivostok, having sent round a report confirming the development of the pestilence into a pneumonic complexion, I was instructed to visit the ground for investigation at first hand. I started from Port Arthur on January 2nd, arriving at Harbin on the 4th.

According to the investigation of Surgeon-Col. Oda, the first cases of true and suspect plague at Hailar, North Manchuria, were discoreved early last October, and a few cases have been reported daily since. Moreover, the epidemic was noticed to take on a more malignant complexion gradually, and fear was expressed as to the transition of the disease into the pneumonic, and this fear became

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confirmed in the latter part of December. Accordingly, the scourge spread more rapidly, even threatening to invade South Manchuria. Therefore a surgeon was despatched to the infected zone by the Japanese Epidemic Prevention Department, about the same time that the Chinese Eastern Railway sent a medical expert on a similar errand. The reports sent by the two experts from the infected district all but verified the previous diagnosis of the cases.

According to the statement of Dr. Woo-lienteh, in charge of the Epidemic Prevention for the Three Eastern Provinces, at the town of Hailar, a system of house-to-house visitation, together with the investigation of all deaths, was opened by the cooperation of the police and the troops, since some such precaution was deemed necessary. This system is being enforced, and the report of the discovery of an abandoned corpse was rewarded with ¥5 in large dollars echa.

It was further proposed that, in order to secure a thoroughness in the epidemic prevention, the whole town of Hailar should be surrounded with Chinese troops for the purpose of isolating it, that a large detaining station should be established at Hailar, and that all people entraining and detraining at Hailar should be detained for five days, and such as are pronounced non-infected only should be permitted to take train.

At Harbin, also, the system of house-to-house visitation and the examination of all corpses are said to have been introduced.

Profiting by the lessons given by the previous pneumonic plague epidemic of 1910—1911 in South Manchuria, the movement of the multitudes of Chinese coolies in Manchuria was considered as furnishing a very useful cue in forecasting which direction the scourge might take in its spread and in organizing an effectual prevention plan for South Manchuria.

An investigation showed that about thirty people entrain daily at Hailar to travel southward by rail. It being unknown how many of them get off the train at Harbin, a request was made to the Japanese Consulate-General, Harbin, to ascertain the number, if possible.

My investigation of the matter while at Changchun on my homeward journey resulted in finding out that the third class Chinese passengers detraining at the Changchun Junction Station from the Chinese Eastern Railway numbered on an average 500 in the morning, from 800 to 1,000 in the afternoon, and from 400 to 500 at night. Of these figures, coolies are supposed to take up roughly one-half. How

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far south these coolies travel, together with their number, ought to be learned for reference sake as early as possible.

The associated epidemic prevention conference held at Harbin on January 4, 1921, was attended by Lieut.-Gen. Affanashieff (Chief of the Civil Administration Service of the Chinese Eastern Railway) and eight others for the Russian side, Dr. Woo-lienteh and four others for the Chinese side, and Consul-Gen. Matsushima and six others for the Japanese side.

Lieut.-Gen. Affanashieff (Chairman) caused the official of the Chinese Eastern Railway in charge of epidemic prevention to read a report on the plague situation about Hailar, along with the demands presented to the Military Commander of Heilungkiang Province, in which Hailar is situated, through a Russian expert in connection with the control of the scourge about Hailar.

The chair then based his opinion upon these reports, saying that, in addition to the isolation of the railway town of Hailar, a medical barrier should be raised on the Hingan Range for isolation purposes. Japanese Consul-Gen. Matsushima stated that, as the pneumonic plague was spreading with an alarming celerity and might break out at any point along the Chinese Eastern Railway, and especially as Harbin appeared to lie under impending menace, the execution of a thorough prevention plan was in sore need, and submitted the results of deliberations of the Japanese specialists held two days before as follow :—

1. Organization of the Sino-Russian-Japanese epidemic prevention committee.

2. Suspension of issue of railway tickets at Hailar until further notice.

3. Investigation of cases of sudden death daily, and report to the Committee of the circumstances, number, etc., of deaths.

4. Institution of house-to-house visitation at Harbin so as to secure an early discovery of the cases.

5. Enforcement of anti-plague vaccination on the troops, police, and coolies at a suitable time.

6. Investigation of living condition and movement of Chinese coolies.

7. Retention of the twenty-five railway goods cars for the purpose of isolation and detention until further notice, and introduction of new suitable and desirable arrangements into them.

8. To keep on hand masks for the use of those isolated at the detention house.

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Opinions were exchanged between Dr. Jazensky (Superintendent of the Russian Hospital), Dr. Woo, and the Japanese delegates.

As the result, it was unanimously decided that the proposed organization of the Sino-Russian-Japanese epidemic prevention committee, although practically realized at the preceding conference held at the Chinese Custom House, should be enlarged in scope and be convened when deemed necessary.

As to Item 2, it failed to secure the support of the necessary majority. Now that the town of Hailar was surrounded with Chinese troops and five days' detention of the railway passengers was on the tapis, it was deemed too severe to deny railway passage altogether at Hailar. All the rest of the propositions were approved without division.

Then, the Chinese delegates explained in detail as regards the measures being actually followed on the Chinese side.

The pneumonic plague situation about Hailar appears to be quite advanced, and with reference to the preventive measures, both the Russian and Japanese authorities concerned recognized the necessity to resort to every conceivable device not to let the disease germs get out of Hailar, and part of the plan was in process of execution. However, the Chinese are remarkable more for theorizing than for practice. Then, speaking of the Russian side, the patrolling and policing of the Chinese Eastern Railway Area, not to mention the general administrative authority, have been practically lost to them. It is thought to be within range of possibility that the epidemic will sally forth outside the existing cordon of the medical prevention and will proceed southward like a rushing flood. Once the dread scourge were to take its fatal grip on any point in South Manchuria, it would be extremely difficult to exterminate it, and on this account, the first requisite step to be taken will be to put up an extensive detention house at Changchun, which lies on the boundary line between the Russian and Japanese spheres of influence, with the object of intercepting the southward progress of the epidemic. If necessary, the South Manchuria Railway Company may be caused to refuse to carry the south-bound Chinese coolies by train.

A Report from Hailar.

A report given by Japanese Surgeon Murakami, at Hailar, says that there are a good number of unreported deaths of the plague about Hailar daily, according

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to the Chinese army surgeons. At a place between Hailar and Manchouli, one fresh case occurred, and a sudden death suspected to be a case of the plague took place at Jalainor (where a colliery is located). At Side-tracking Station No. 16, and also at Jaron, four Chinese requiring isolation slipped away from under restraint.

More Plague Cases at Hailar.

On January 8, the corpse of a Chinese coolie was discovered in a street of Pristan, Harbin. On the following day, another abandoned Chinese body was found at Fuchiatien (Chinese Town of Harbin). The Chinese authorities have explained that the former was a case of starvation and the latter the remains of an opium fiend. As both bodies had been removed before the Japanese authorities could hold a post mortem examination, there was no way left open to either confirm or refute the Chinese statement.

According to Japanese Surgeon Murakami at Hailar, five fresh cases of plague have broken out at a small colony of Koreans north of Hailar, where the first plague case of the present epidemic appeared.

Further News from Hailar.

Further news from Hailar informs that on January 11, an epidemic prevention conference was held at Hailar conjointly by the Russian, Chinese, and Japanese delegates, and according to one of the resolutions adopted at the meeting, the Japanese Consul and the Chinese Eastern Railway people were asked to demand of the Chinese military authorities concerned at Tsitsihar, the seat of the Provincial Government, to effect the isolation of the Chinese Town of Hailar by organizing a military cordon around the Town. The Chinese side replied that they would take proper action after the investigation of the existing affairs.

As a dozen Chinese coal miners were stricken with plague on January 12 at Jalainor, the issue of railway tickets at that Station has been stopped, the same as at Hailar, and the detention of all intending passengers for five days for isolation and observation has also been enforced at Jalainor.

In view of the alarming developments of the plague situation, it has been arranged to hold an epidemic prevention meeting at the Chinese Custom House

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every Monday, to be attended by Japanese Consul-Gen. Matsushima, Surgeon-Col. Oda, and seven Russian and Chinese officials and experts.

Precautions at Changchun & Mukden.

As a precaution against the invasion of South Manchuria by the plague prevalent about Hailar, a medical observation of the south-bound passengers has been enforced at the Changchun Junction Station. In order to guard against eventualities, a meeting of the chief officials concerned, together with some surgeons of the Japanese Railway Guards at Changchun and Kwanchengtzu, was held there on the morning of January 17. As a result, it was decided to build a temporary siding to the vacant lot on the south side of the Railway track about midway between Changchun and Kwanchengtzu, and to keep on the new siding eight box cars for use as an improviso detention place. Provisions were also made for the microscopic examination of rats.

A like precaution was taken also at Mukden. Four box cars are kept on one of the sidings in the Station yard for the isolation of suspect cases. The extermination of rats in the goods cars is to be effectively enforced, and the rats so caught are to be subjected to a microscopic inspection.

Plague near Harbin.

A case of plague broke out at Fuchiatien (the Chinese Quarter of Harbin) on January 20,1921; another appeared at the colliery at Jalainor. On the 22nd, both cases ended fatally after a fit of hemoptysis. Both were pronounced cases of plague upon a post-mortem examination. The inmates of the infected homes were isolated.

KIRIN-CHANGCHUN LINE.

Responsibility for Transportation of Goods.

The Kirin-Changchun Line of the Chinese Government Railways has announced the introduction of the detail regulations concerning the Responsibility for transportation of Goods by goods train on and after January 1, 1921.

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The same regulations apply also to the through goods for conveyance between the Chinese Line and the South Manchuria Railway Lines, as far as the former line is concerned.

The regulations run as follow:—

The Kirin-Changchun Line shall assume responsibility on the following conditions in terms of the provisions of Art. 7 of the Regulations concerning transportation of Goods over the Chinese Government Railways.

Specified cases being excepted, the insurance premium for assuming responsibility being included in the freight money, it shall not be charged separately.

CONDITIONS.

Art. 1. The Railway shall answer for the actions of its employees in the performance of their duties concerning the transportation of goods.

Art. 2. The Railway shall assume the responsibility for indemnity for any loss resulting from any loss or damage caused to goods from the time when they were entrusted to the Company's custody till the time of their delivery to the consignees, except in any of the following cases:—

a) Any loss or damage caused by *force majeur.*

b) Any loss or damage caused by the nature of goods or by faulty packing.

c) Any loss or damage caused by the fault of either owner or consignor.

d) Treasure consigned under false declaration.

e) In the case of goods carried by open (flat and gondola) cars, any loss resulting from the risk peculiar to such cars.

f) Any loss resulting from the risk peculiar to the transportation of animals.

g) Any loss resulting from faulty loading or unloading of goods, for which the loading and unloading operations are to be undertaken by the owners.

h) Any loss in the case of goods accompanied by an escort, which has resulted from such risks as may have been removed by the escort.

In any of the above-mentioned conditions, unless the owners have satisfactorily proved to the contrary, the loss in question shall be inferred as resulting from the given cause.

Art. 3. The Company shall assume no responsibility for any loss that has not been mentioned by the consignee when taking delivery of the goods.

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Any loss that, in its nature, cannot be discovered at once, but that has been proved to have occurred during the transit, shall be indemnified only when such indemnity has been applied for within seven days of the delivery of such goods.

Art. 4. The indemnity amount for any loss or damage caused to goods shall be determined by the authorities concerned according to the ordinary prices at the place of despatch at the time of their booking, and the freight money, if already paid, shall be refunded according to the extent of the loss or damage.

Art. 5. When, on the lapse of 72 hours after the goods have been booked and entrusted to the Company's custody, the Railway fails to deliver the goods owing to the causes for which the Railway is to answer, the Railway shall pay as indemnity one-thirtieth of the freight money for every twenty-four hours that have passed from the time when the goods were claimed by the consignors till the time when the goods have been actually delivered.

Under no circumstances, the above-mentioned indemnity shall exceed the freight money.

The above shall not apply when the Railway has proved that the above mentioned loss has been caused by other than the commissions or omissions of the Railway or by circumstances beyond the control of the Railway.

DETAIL REGULATIONS CONCERNING MIXED STORAGE OF BEAN CAKE.

Of South Manchuria Railway Company.

The South Manchuria Railway Company revised the detail regulations governing the Mixed Storage of Bean Cake and has given effect to the same from January 11, 1921.

They are, in substance, as follow:—

CHAPTER I. ACCEPTANCE.

Art. 1. Regarding the acceptance of Bean Cake for mixed storage, Chapter I. of the detail regulations concerning the Mixed Storage of Bean Cake, issued as A 98 of the Company's Traffic Department in October, 1919, (to be referred to hereafter simply as detail regulations concerning Mixed Storage of Bean Cake) shall apply.

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CHAPTER II. EXAMINATION AND WEIGHING.

Art. 2. For an examination, a lot consisting of Bean Cake at the same cooling degree shall be presented, and any of different cooling degrees, if found mixed at the examination, shall be replaced with such as is of the same cooling degree. In case of the required replacement failing to be made, the whole of the lot shall be treated as weighing as much as the heaviest of the lot.

Art. 3. All Bean Cake falling under any of the following heads shall be dealt with as failing to pass the examination :—

a. Such as may be mistaken for Blue or Black Cake by reason of the mixture of blue or black beans.

b. Such as has cracks and is liable to damage because of insufficient pressure while in course of manufacture.

c. Such as has been damaged by rain, dew, frost, or snow.

d. Such as contains precipitations of Bean Oil or earth or sand.

e. Such as has traces of having been shaved or sliced off on the reverse side.

f. Such as has become mouldy or discoloured owing to the lapse of long time after manufacture.

Art. 4. On the completion of the examination of the quality, the weight shall be ascertained in the presence of the owner, at the same time whether or not there is any mark of the manufacturers on each piece being inspected.

Art. 5. For all goods that have passed the examination mentioned in the preceding two articles, a black stripe shall be put on every piece, as specially stipulated, whilst for all goods failing to pass, three red stripes shall be put additionally on each piece.

Art. 6. All goods failing to pass shall be caused to be removed out of the Wharf ground without delay, except such as has been entrusted to the Company's custody for ordinary storage. In case of such goods failing to be removed within the period allowed, storage shall be charged therefor as stipulated. In case of fifteen days having elapsed after notice has been issued for removal out of the Wharf ground, the matter shall be reported to the Superintendent of the Company's Traffic Division concerned (and for such as is under custody of the Wharf Office, Dairen, to the Superintendent-General of the Wharf Office) for directions.

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Art. 7. In case of the absence of the manufacturers' mark or the mixture of inferior goods having been discovered, when it is considered as due to the wilfulness or serious fault of the owners, a warning shall be given the owners, and, besides, the matter shall be reported to the Superintendent of the Company's Traffic Division concerned (and for such as is under custody of the Wharf Office, Dairen, to the Superintendent-General of the Wharf Office) for directions.

Art. 8. At a railway station, which has no examiners attached thereto, arrangement shall be made with another keeping examiners to visit the former to render examination services periodically or whenever the goods accepted for custody have reached a suitable quantity.

Chapter III. On Private Sidings.

Art. 9. For goods entrusted to the Company's custody on the private sidings of a Mixed Storage Station, the examiners attached to the Station shall visit the sidings for the purpose of examination either periodically or whenever the goods entrusted into custody reach suitable quantities.

Art. 10. On none of the private sidings, the removal of any goods under custody shall be effected.

Chapter IV. Receipt and Storage.

Art. 11. For the receipt and storage of goods, the provisions of Chapter IV. of the detail regulations of the Mixed Storage of Beans shall apply.

Art. 12. In case of the damage mentioned in Articles 14 and 15 of the Conditions for the Mixed Storage of Bean Cake having been discovered, the matter shall be reported at once to the Managing Director of the Company's Traffic Department for directions.

Chapter V. Mixed Storage for Arrived Goods.

For the formalities concerning the Mixed Storage for arrived goods, the provisions of Chapter VI. of the detail regulations concerning the Mixed Storage of Beans shall apply.

Chapter VI. Shifting.

Art. 14. In case of the Station of Receipt and the Station of Removal not being the same, for the shifting of the goods from the one station to the other,

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the provisions of Chapter V. of the detail regulations concerning the Mixed Storage of Beans shall apply.

Art. 15. For all documents and papers concerning the transportation of Bean Cake for Mixed Storage and the way bills for goods for Mixed Storage on arrival, separate envelopes shall be used, marked in red "Bean Cake for Mixed Storage" and "Bean Cake for Mixed Storage on arrival" respectively.

Chapter VII. Removal.

For removal from the Company's custody, the provisions of Chapter VIII. of the detail regulations concerning the Mixed Storage of Bean Cake shall apply.

Chapter VIII. Disposal of Extra Bean Cake.

Art. 17. The extra Bean Cake added at the ratio of 2 pieces per 1,000 pieces according to Clause 1, Art. 24 of the Conditions concerning the Mixed Storage of Bean Cake shall be shifted at the same time as the principal goods.

The extra Bean Cake above mentioned shall be stored separately, for the purpose of replacement therewith when there happen to be pieces of Bean Cake badly damaged.

At a station of removal, the daily receipts and removals shall be entered on the books plainly, and the particulars shall be included in the monthly report to the Traffic Office of the Company's Traffic Department before the 5th of the succeeding month.

Chapter IX. Fee for Special Handling.

Art. 18. For Bean Cake arriving at or carried into Dairen or Yingkou, Blue and Black Cake and Rimmed Cake not being included, (Bean Cake despatched from Shuangchengpu and other Through Traffic Stations on the Harbin-Kwanchengtzu Section of the Chinese Eastern Railway being excepted) which is not presented for Mixed Storage, a fee for special handling shall be charged at the time of payment of the freight money or at the time of receipt into the Company's custody.

For the fee for special handling, tickets for sundry charges shall be issued for the settlement of the accounts.

Art. 19. For any through goods despatched from a station other than a Mixed Storage station or from a railway under Through Traffic arrangement with the South

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Manchuria Railway Company, for which no formalities have been gone through for Mixed Storage on Arrival at the destination at the time of consignment, but for which the formalities for Mixed Storage have been fulfilled on their actual arrival at the destination, the fee for special handling shall not be charged.

In such case, if the fee mentioned has been already paid, the formalities shall be gone through for refundment.

(The remainder is left out for the obvious reason that it is considered to be of only little interest to the owners of goods.)

EXAMINATION OF FOREIGNERS' PASSPORTS TO BE STOPPED.

In South Manchuria Railway Area.

The examination of the passports carried by foreigners traveling in Manchuria has been enforced by the Japanese authorities with the express object of preventing any Bolsheviks from stealing into the South Manchuria Railway Area.

The Japanese Government has announced its intended suspension of the examination above mentioned, from February 1st, 1921, excepting the Kwantung Leased Territory and Chosen, in which the same examination is to continue.

"MANCHURIA DAILY NEWS."

As announced in the issue of the *Manchuria Daily News* on November 27, 1920, the same journal is to restart its publication from February 12 (the day following "Kigensetsu," one of the three greatest Japanese national holidays), beginning with six editions per month, that is, once every five days. In case of the fifth day calculated from the date of the last issue falling on either Sunday or a national holiday, the edition in question will appear on the previous Saturday or the day preceding the holiday.

The Proprietor and Editor is Mr. Z. Hamamura, who is founder of the journal and had been Editor and Manager since the very beginning till November, 1919, in which month unavoidable circumstances forced an indefinite suspension of issue upon the journal.

Mr. Z. Nagata, Vice-President, the Kwantung Pao, Ltd., a daily edited in Chinese at Dairen, who ran for Parliament at a Shizuoka Constituency at the

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last general election and was defeated by a very narrow margin, has joined the *Manchuria Daily News* as partner in the capacity of Vice-President and Representative, the Proprietor himself being President and Representative.

In passing, the monthly subscription is 40 sen a copy, and for mailing, 15 sen per month extra is charged for postage to any address in South Manchuria and cities in China, North Manchuria, and Siberia, where there are Japanese post offices, in addition to Japan. For an address in a foreign country other than above mentioned, the postage will be double the above mentioned amount.

The management hopes to increase the number of monthly issues from six to ten times, as an intermediate step in restoring the journal to a regular daily affair.

TRADE & INDUSTRY.

PROSPECT OF STAPLE PRODUCE MARKET.

The bean milling community of Dairen has been indicating of late salutary signs of a decided revival because of the terms becoming more negotiable, after a spell of the most intense pessimism, owing to the stoppage of export of Bean Oil.

However, the prospect is far from reassuring. The export of Bean Oil to the United States remains totally blocked, kept off by the animal oils and cotton-seed oil produced domestically. Next, as regards export to Europe, many dealers concerned have gone under in consequence of the severe economic depression. Those at Hull, England, are said to have suffered the worst. Consequently, in spite of the current quotations on the market being quite workable, only little business is being done. Such a phenomenon prevails not only in the Bean Oil market, but also the Bean market. It is reported that the extensive bean mill at Stettin, Germany, under management of Messrs. Wassards, who keep a branch at Dairen, Harbin, etc., remains suspended from operation. Bean mills at the principal manufacturing centres in England, etc., under the effect of the very low prices of oils in general, either have stopped work or intend to do so.

Such being how matters stand, unless Bean Oil put out in the Orient goes down further in price, or else cotton-seed and other oils, for which Bean Oil is available

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as subtitute, rise in price so high as to make their use by the manufacturers interested practically prohibitive, the thick gloom now settling over the Bean Oil situation is unlikely to be lifted perceptibly.

Then, as to Bean Cake, what used to be shipped Germany way through Denmark prior to the Great War was not inconsiderable. But it appears to have been used mainly as fodder. The demand in this direction ceased with the outbreak of the war. On the close of the hostilities, it was incorporated among the crushing peace terms imposed upon Germany to hand over all the domestic live stock in Germany to the victorious Allies to make up for the shortage of the War Indemnity. Accordingly, there is only slender hope for Manchurian Bean Cake being exported to Germany as cattle-feed.

Manchurian Bean Oil is claimed to have been raised to the dignity of an international commodity, but the result of its technical analysis shows it to compare with its rival oils produced in the United States and Europe anything but favourably. It would be safer to take the view that more or less demand is kept up only because of the cheaper prices.

Again, allowing the Emergency Tariff of the United States to be adopted and legalized, it cannot be for immediate introduction.

Everything being considered, the oversea prospects may scarcely be called encouraging.

Lastly, turning to the prevailing condition in Manchuria, the producing centre, the movement of the staple produce comprising Beans, Bean Cake, and Bean Oil, has been considerably delayed. The arrivals at Dairen, staple produce and other cereals put together, increased and exceeded 300 carloads or 9,000 tons a day in the middle of January.

Then, the Chinese economic circles border on a crisis owing to the sharp fall of silver, and about Changchun, such first rate business houses as have been driven to the wall already number more than a dozen. The insolvency of the great Fa Company, Yingkou, as noticed elsewhere, demonstrates how seriously the Chinese mercantile community has suffered. Quite a number of influential firms closely connected with the great Yingkou house have been also engulfed.

All along the South Manchuria Railway Lines, the foremost Chinese firms at the chief centres have relapsed into utter inaction, leaving only the minor merchants to do business as best as they may. Money has consequently become

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extremely tight, and few houses retain the means enough to hold stocks under their own custody. The popular course for the dealers to pursue is to place the purchased stocks under the Mixed Storage of the South Manchuria Railway Company so as to secure the financing facility available.

The movement of Bean stocks is expected to increase substantially just before the old Chinese New Year, thereby further weakening the market tone.

Speaking of the Rice market at home, in Japan, effort is being made to check the descending tendency by means of the restrictions of sale, but the intrinsic merit of such an artificial check leaves ample room for doubt.

It may be added that the lower rice price sinks in Japan, the less will be the buying power of the farming classes, who extensively use Bean Cake as fertilizer for the wheat, rice, etc.

We are indebted for the above interesting observation to Mr. T. Nakanishi, Manager of the local Koderas.

PROPOSED SINO-AMERICAN BANK.

Branch to be opened at Mukden.

According to one of the latest reports, the proposed Sino-American Bank, whose establishment on a capital of $20,000,000 is under contemplation at Shanghai, is said to be negotiating with the Chinese Commercial Guild, Mukden, about the opening of a branch office within the walls of Mukden.

It is further rumoured that the new bank intends to assign half the capital to investment at the discretion of the new Mukden branch, and also to render low-interest loan services on the security of real estate.

Abrupt Fall of Silver.

With the abrupt fall of silver, the Chinese Small Silver Coins have also dropped.

For instance, at Liaoyang, on December 16, 1920, the mean exchange rates to G.¥100 stood at S.¥92.63 in Chinese large dollars and S.¥111.36 in Chinese Small Silver Coins, being a fall of S.¥52.4 (about 130%) with the former, and of S.¥65.65 (about 140%) with the latter, as compared with January, 1920.

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The mean exchange quotations at the principal centres for 1920 were as follow (to G.¥100 in Japanese currency):—

	In Large Dollars		In Chinese Small Silver Coins
	Changchun	Mukden	Liaoyang	Chengchiatun
January	S.¥40.98	S.¥40.74	S.¥40.23	S.¥45.71
February	40.99	43.06	44.08	49.57
March	43.53	?	43.40	52.99
April	49.18	?	48.82	56.60
May	60.05	?	60.23	73.82
June	69.08	67.80	69.56	87.60
July	68.63	68.61	68.46	85.15
August	63.18	64.23	62.54	76.74
September	67.18	66.57	66.42	79.23
October	74.87	75.05	72.87	86.38
November	79.41	79.68	80.43	93.01
December (16th)	92.74	?	92.63	111.36
Mean monthly quotations	51.15	55.36	53.49	67.14

The depreciation of the silver notes and Kirin Provincial notes has been more pronounced than that of Small Silver Coins, as may be easily appreciated. The reckless issue of these notes, their inconvertibility, the decrease of demand attendant upon the general depression of the economic circle, etc., may be counted as the chief causes of the sharp fall.

The exchange quotations at Liaoyang on December 16, 1920, show that large dollars were at S.¥120.4 to G.¥100 and Provincial notes at 7,225 *tiaos* also to G.¥100, being S.¥70.73 (about 140%) and 5,445,5 *tiaos* (about 300%) lower respectively than the figures for January, 1920.

The mean exchange quotations at the principal centres for 1920 of Chinese large dollar notes and Kirin Provincial notes to G.¥100 in Japanese currency were as follow:—

	In Large Dollar Notes		In Kirin Provincial notes
	Mukden	Liaoyang	Changchun
January	S.¥ 51.94	S.¥ 49.67	1,779.50 *tiaos*
February	53.83	52.41	2,063.15 »
March	?	58.65	2,670.00 »
April	?	64.50	3,206.99 »
May	?	83.10	4,117.58 »
June	97.59	98.25	4,259.00 »
July	100.47	101.54	5,114.00 »
August	91.40	91.34	3,862.00 »
September	92.75	88.91	3,829.00 »
October	96.30	94.96	4,106.51 »
November	102.27	102.56	4,787.24 »
December (16th)	?	120.40	5,225.00 »
Mean monthly quotations.	80.01	93.47	2,526.59 »

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In passing, the Yokohama Specie Bank silver notes were quoted at Liaoyang on December 16, 1920, at S. ¥93.22, being a remarkable drop of S. ¥49.66 (about 110%), in comparison with the preceding year. Compared with Small Silver Coin notes, the Y. S. B. notes were some 30% higher.

Bad Effect of Fall.

As previously remarked, the decline of Chinese currencies was due also to the disorganized condition of the financial and currency systems of China, besides the steady fall of silver specie in value. Especially, as regards Kirin Provincial notes, they have issued with the most audacious recklessness, the aggregate amount so far issued being calculated at not less than 2,400,000,000 *tiaos*.

The continued fall of the Chinese currency has had the effect of reducing general business transactions among the Chinese and shaking up the foundation on which the loan services rested, not to mention the considerable loss, both tangible and otherwise.

It is under such circumstances that, at several centres in Manchuria, many Chinese business houses of erstwhile sound financial standing have had to plead bankruptcy under the double blow of the serious economic ebb and the sharp drop of the Chinese currencies.

PRODUCE RECEIVED AT SEABOARD PORTS.

During December, 1920.

The arrivals of Beans and Bean Cake at Dairen during December, 1920, totalled 175,095 tons of Beans, being an increase of 29,502 tons, and 22,779 tons of Bean Cake, being a decrease of 4,737 tons, as compared with the same month of the preceding year.

The figures for Yingkou (Newchwang) also for the same month were 1,020 tons of Beans, being an increase of 770 tons on the same month of the previous year.

Those for Antung were only 4 tons each of Beans and Bean Cake, being decreases of 1,261 tons and 2,313 tons respectively from the previous year.

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At Mukden Station, 1,650 tons of Beans were received, being an increment of 1,525 tons, and 1,650 tons of Bean Cake, being an increase of 1,525 tons over the preceding year.

The aggregate reached 200,548 tons, showing an increase of 23,405 tons, over the corresponding period of the previous year.

FAILURE OF GREAT CHINESE HOUSE, THE FA COMPANY.

The failure of the great Chinese commercial house of the Fa Company of Yingkou, Newchwang, has engulfed all the trade houses at many other centres financially connected more or less closely with the central house at Yingkou. At Kaiyuan, all sorts of rumours were set afloat concerning the correspondents with the firm in trouble even as far back as a few months ago. The blow inflicted upon them varies in severity according as how closely they are related to the Yingkou house. Both the Wenfaho and the Pufaho at Kaiyuan have suffered most. Both were satisfied of their inevitable doom and threw themselves to the mercy of their creditors. The one that drew the deepest sympathy is the Lifaho, of which Mr. Wang-chihchung is Manager. This gentleman has figured prominently among the Chinese businessmen of Kaiyuan, which is growing in importance as produce centre with almost unparalleled rapidity. Mr. Wang has been summoned to Yingkou for examination as regards his business relations with the Yingkou principal. Why he is the focus of sympathy is because, through his ability and influence, the Kaiyuan house has lost nothing, but has, on the contrary, gained something. Still out of respect for his own honour involved in the reverses of his Yingkou principal, he ungrudgingly produced the whole of the assets of the Kaiyuan concern to be disposed of in the interest of the principal. His integrity of purpose was also exemplified by suspending all future operations the moment he made up his mind to close up the accounts of his firm. This course was heartily complimented upon. In such circumstances, it is prophesied that, although the name of the Lifaho may cease to exist at Kaiyuan, its interests will be taken over by a suitable successor to resume active operations in the economic circle of the same town.

The Houfaho (another Chinese firm closely related to the Fa Company, the insolvent) has fallen into a similar fix to the Lifaho. The Huafaho has

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given out that it has suffered no loss, but seeing that the Tungfaho, the Ifaho, and a few others of the same financial stock have been driven to the wall, it is supposed by many people that the Huafaho, too, may not be raised to its feet again.

A report says that the proprietor of the Fa Company is a great landed proprietor at Chinwangtao and is said to control a company capitalized at S. ¥20,000,000. The total loss of the firm is feared to run up to S. ¥20,000,000, and it is considered as impossible to save everything. On this account, when the affairs have been straightened out, half the business houses closely related to the Fa Company will become bankrupt.

If the great Fa Company should be ruined, in the wake of he fall of the Hsi-Yishun, the Transfer-Money Office, Yingkou, will have the Tungyungmow only left in active business, and the future of the Transfer-Money Office looks most gloomy.

In Relief of the Tottering Firm.

In view of the serious consequences to the bankruptcy of the Fa Company, in the event of its becoming an accomplished fact, the District Superintendent of Yingkou and other influential Chinese worked hard together to devise some relief measure and appealed to the Bank of Chosen for assistance. As a result, the Bank agreed to loan ¥350,000 on January 23, opening the loan services on the same date. The assets of the Chinese firm have been produced for security.

COTTON YARN AND CLOTH MARKET IN MANCHURIA.

Looking over the Cotton Yarn and Cloth Market in Manchuria, the stocks of Cotton Yarn in the interior markets have run short, and as the merchants have been withholding their purchases as far as possible, their buying inclination has become suddenly quickened on the turn of the year, and quite a good deal of business has been put through at Dairen.

As regards Cotton Cloth, immaterial orders have been received from Yingkou, Kaiyuan, Changchun, and a few other places only, and there lies a considerable stock of which the major portion is held by the banks as security, leaving only an inconsiderable amount available for sale on the market. At all events,

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business has been dead flat almost everywhere inclusive of Dairen. This is perhaps because, owing to the comparative cheapness of the Chinese outputs, they have been in increasing demand.

However, considering that the Cotton market has not yet got out of the season of slow demand, and also that money is still extremely tight on the Chinese market, even what light business there has been transacted on the local and other markets can hardly be called very unfavourable.

The abrupt fall on the local currency market taking place on January 8th has dealt a severe blow to the Cotton market, dampening what a semblance of life there was and stifling all the buying inclination on the market. From these circumstances, it is easy to infer that the future of the Cotton market will depend in a large measure upon the silver exchange condition, and in the event of silver weakening further, it will be too much to expect any substantial revival. But if some reactionary rise of silver should occur, a decided improvement is believed to be introduced, especially with the approach of the old Chinese New Year.

SHIPPING NEWS.

ON BOARD DAIREN-SHANGHAI LINERS.

Nobody Admitted on Board.

On and after January 11, 1921, nobody is permitted to go on board either the s.s. *Sakaki Maru* or the s.s. *Kobe Maru*, on the S. M. R. Co. Dairen-Shanghai Twice-Every Nine. Days Service, either to see a passenger off or to meet one arriving.

Any one other than a passenger desirous of going on board either steamer on most urgent business may apply to the Shipping Office of the Wharf Office.

The above restrictions have been introduced from the consideration of epidemic prevention and also for the preclusion of confusion on board.

All vessels at berth in Dairen Harbour are compulsorily required to use rat-guards on their mooring hawsers and to take other precautions to foreclose possible communication of rats ashore with the vessels.

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It may be mentioned in this connection that during last December plague-infected rats were discovered in the Foreign Settlement, Shanghai, at a distance of about 240 yards from the S. M. R. Co. Wharf. As both the Osaka Shosen Kaisha and the Nippon Yusen Kaisha Wharves are located in the neighbourhoods, the Settlement authorities were led to think that the infected rats had got in via the S. M. R. Co. Wharf. At any rate, it is said that the Harbour Master of the Shanghai Customs notified the S. M. R. Co. of his intention to enforce upon the Railway Company's steamers the measures to exterminate the rats on board, beginning on December 29, 1920.

After the above incident, another plague-infected rat is said to have been discovered at a point a little north of the spot of the preceding discovery.

T. K. K. S.S. "SIBERIA MARU."

Her First Call at Dairen.

The Toyo Kisen Kaisha steamer *Siberia Maru* (over 11,000 tons) on the Japan-San Francisco service, put in the port of Dairen for the first time after her call at Dairen was decided upon, early on the evening of January 5, 1921, and was berthed on Wharf No. 3. At 10 a.m. on the 6th, about three hundred residents of Port Arthur and Dairen were invited to inspect the handsome liner. An "At Home" reception was given on board at 1 p.m. The function was enlivened with selections by the Muraoka Orchestra specially engaged for the occasion. Mr. Harada (on the Directorate of the Toyo Kisen Kaisha), in welcome of the company, requested their undivided support for the Company's new enterprise in initiating the call at the port of Dairen. Vice-President Nakanishi of the South Manchuria Railway Company responded appropriately to the greetings of the host.

In passing, the *Siberia Maru* was built by the Newport News Shipbuilding & Dry Dock Co., New Port News, Virginia, U. S. A. She was launched in October, 1901. Her maximum speed is twenty-one knots. Her passenger accommodation comprises 231 first class, 50 special third, and 473 steerage passengers, making the total of 754 passengers. Her crew consists of 276 officers and men.

The steamer set sail for San Francisco, via Kobe and Yokohama, on the afternoon of the 7th.

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The following is her passenger tariff:—

	To			
	Yokohama	Kobe	Shanghai	San Francisco
1st Cl.	¥90	¥70	¥65	G.$364
2nd Cl.	60	50	45	—
Special 3rd.	36	27	29	G.$60
Steerage	25	21	15	—

It may be added that, owing to the emigration restrictions now in force with the United States, no direct passage can be booked from Dairen to San Francisco with regard to the 2nd and 3rd classes, the 1st class tickets being the only kind issuable at Dairen for San Francisco.

BUSTLING IN DAIREN SHIPPING.

Whilst the nautical circle has been going from bad to worse chiefly owing to surplus tonnage, the shipping traffic at Dairen Wharves has been steadily following an increasing tendency year after year.

January, being the height of the produce export season, the Dairen harbour has been bustling daily with a fleet of vessels numbering not less than twenty.

The busy traffic has been further enlivened by the call of the European and American liners of the Toyo Kisen Kaisha and the Osaka Shosen Kaisha.

To give the figures for several days early in January,

	No. of steamers	Total tonnage
January 4	21	43,045 tons
5	20	34,821 „
6	20	46,695 „
7	24	53,833 „
8	23	33,928 „

O. S. K. TRANS-PACIFIC STEAMER "ARIZONA MARU."

The Osaka Shosen Kaisha s.s. *Arizona Maru* (9,695 tons) on the Company's North American Line, put in Dairen at 11 a.m. on January 21. Like the *Alabama Maru* and the *Persia Maru*, which are both of the same type as the *Arizona Maru*, she can accommodate 39 cabin and 340 steerage passengers, but will be employed more as a cargo boat.

She took in at Dairen 20 carloads of Bean Cake (20,000 pieces), besides Beans and general cargo to the amount of 750 tons. She loaded 3,400 tons of coal also at Dairen and set sail for Kobe on the morning of the 23rd.

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On the last Westward (homeward) trip, she set sail from Seattle on December 1st, 1920, and loaded 500 tons of copra, etc., at Manila, and 800 tons general cargo for Japan ports at Hongkong, arriving at Shanghai on January 17, and loading a quantity of Wood Oil there.

O. S. K. Liner "Himalaya Maru."

The O. S. K. European liner *Himalaya Maru* put in Dairen on the morning of January 27 to load here 600 tons of Seeds, 300 tons of produce for Hongkong, and 140 tons of wheat, in addition to 2,300 tons of bunkers, sailing from Dairen on the 29th, for Europe via Shanghai and Hongkong.

Under the auspices of Mr. Y. Aioi (Chairman, Chamber of Commerce, Dairen) a luncheon was given the officers of the cargo steamer at the Yamato Hotel on the 27th.

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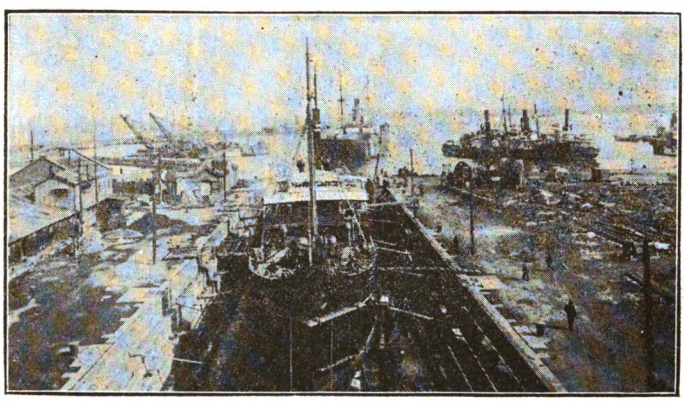

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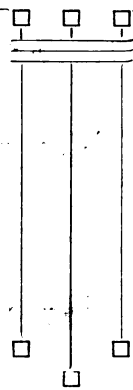

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LIGHT OF MANCHURIA

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THE MONTHLY ORGAN OF
THE MANCHURIA ENLIGHTENING SOCIETY.

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THE
LIGHT OF MANCHURIA

PRESENT AND FUTURE OF FUSHUN COLLIERIES.

By Mr. S. Otsuru.

Coal and Iron of Manchuria.

The marvellous progress of civilization and accumulation of wealth during the Nineteenth Century may be ascribed solely to the mechanical inventions and devices. What is made into machinery is iron, and what actuates machinery is indirectly coal. The primary value of iron and coal in the modern economic life is all too apparent. The times, in which the human development was based upon timber and charcoal, or, in other words, the age of handicraft is long past. The present is one of mechanical industry sustained by iron and coal. Therefore, where these twin essentials (iron and coal) are found in abundance only, mechanical industry may be built up, attended with an increase in population.

The expansion of the British Empire, the modern rise of Germany, and the exuberant prosperity of the United States must be attributed mostly to the possession of both essentials in plenty.

Mr. Gibbons has once made an interesting observation regarding the ascendency of the destiny of the present-day Great Britain to the following effect:—

Down to the close of the 18th Century, England had been a great industrial country in no sense. She had had to buy a good deal and also learn much of foreign countries. How to use coal as fuel for smelting purposes really opened the promise of an industrial future before Great Britain. By the immense output of iron and steel, the manufacture of machinery was facilitated. Then coal was comparatively cheap to set the machinery in motion. Consequently mechanical industries of various kinds were brought into being. The increase of steel vessels enhanced the superiority of the British commerce and Navy. The brisk export of coal made it possible to lower the ship's freight on coal almost to the plane of ballast, and incidentally made it also workable to reduce the rates on export manufactures. The wonderful development of trade and industry of Great Britain during the 19th Century was principally owing to her possession of iron and coal in abundance obtainable on very moderate terms.

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To give the outputs, or rather consumption, of coal and iron, in 1865, Great Britain produced 55% of the world's coal outputs, making her the world's workshop, as styled by Mr. Cobden.

In the same year, Great Britain, the United States, and Germany yielded 83% of the world's outputs, the rate rising to 85% by 1913 preceding the Great War.

In the course of forty-eight years from 1865 to 1913, the world's coal production had increased from 180,000,000 tons to 1,320,000,000 tons, or nearly sevenfold. In the period intervening, the production of Great Britain had become only trebled; that of Germany had grown ten times over, and that of the United States had increased actually twenty times, the above being an ample index of the amazing expansion of the national development of both the United States and Germany.

Coal Productions of the Powers.

	United States	Great Britain	Germany	Japan	Other countries	Total
1865	24,790	99,790	28,330	—	29,200	102,080
1875	48,200	135,490	48,530	—	53,080	285,300
1885	102,180	161,960	73,670	1,310	73,700	412,810
1895	177,590	194,350	103,960	4,840	100,380	581,120
1905	351,120	239,890	173,660	11,890	149,460	926,020
1913	504,520	287,410	273,650	21,760	233,660	1,321,000

In the above table, the unit is 1,000 tons.

Output Percentages of the Powers.

	United States	Great Britain	Germany	Total	Japan
1865	13.6%	54.2%	15.5%	83.3%	—
1875	16.8%	47.4%	17.0%	81.2%	—
1885	24.7%	39.2%	17.7%	81.6%	0.30%
1895	30.5%	33.4%	17.8%	86.2%	0.83%
1905	37.9%	25.9%	18.7%	82.5%	1.28%
1913	38.1%	21.7%	20.7%	80.5%	1.64%

Coal Outputs of the Powers.

The substantial increase in the coal outputs belongs to the modern times and may be said to date from 1750, in which year how to refine iron ore by use of cokes was invented in Great Britain. The growth of coal outputs has been most

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remarkable in Great Britain, as instanced plainly by the fact that, as early as 1865, the total British yield occupied 52% of the world's aggregate outputs.

Both the United States and Germany also showed a sharp increase, so much so that between the three Powers, Great Britain, the United States, and Germany, 80% of the world's aggregate yield has been produced since 1910.

During the space of 45 years from 1865 to 1910, Great Britain had had her iron production doubled, Germany raised fifteenfold, and the United States as much as thirty-three times.

This, in itself, speaks eloquently of the industrial prosperity of the three Powers in modern times, due, as already observed, to their bountiful wealth in both coal and iron, the twin lever of modern civilization.

Pig Iron Productions of the Powers.

	United States	Great Britain	Germany	Japan	Other countries	Total
1865	840	4,890	970	—	2,750	9,450
1875	2,050	6,430	2,020	—	3,380	13,880
1885	4,110	7,360	3,680	—	4,620	19,770
1895	9,590	7,820	5,460	20	6,450	29,340
1905	23,360	9,740	10,980	80	9,860	54,020
1910	27,740	10,380	14,790	190	13,210	66,310
1913	31,400	10,480	19,290	240	17,600	79,010
1914	33,700	9,000	14,380	300	13,660	71,040
1915	30,390	8,790	11,790	320	12,990	64,280

Percentages to World's Total Yield.

	United States	Great Britain	Germany	Total	Japan
1865	8.8%	51.7%	10.2%	70.7%	—
1875	14.7%	46.3%	14.5%	75.5%	—
1885	20.7%	36.7%	18.6%	76.0%	—
1895	32.3%	26.6%	15.2%	74.1%	0.08%
1905	43.1%	18.0%	20.3%	81.5%	0.14%
1910	41.8%	15.6%	22.3%	79.9%	0.28%
1913	39.7%	13.2%	24.4%	77.3%	0.70%
1914	47.4%	12.6%	20.2%	80.2%	0.42%
1915	40.9%	13.6%	18.3%	78.8%	0.48%

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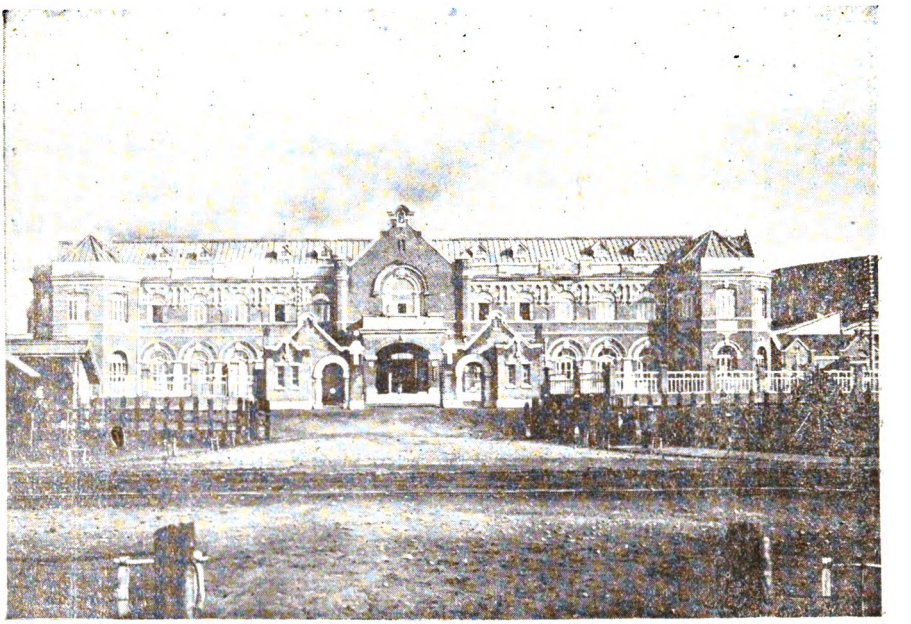

FUSHUN COLLIERIES GENERAL OFFICES, FUSHUN.

Iron and Coal Hoards of the Powers.

As may be easily understood, the iron and coal reserves of each country indicates in a sense the possibilities of its future destiny.

The coal and iron hoards of the principal Powers may be tabulated roughly as follow:—

	Coal	Iron Reserve	
		Visible	Potential
	tons	tons	tons
Germany	423,356,000,000	1,270,000,000	—
Great Britain	189,535,000,000	455,000,000	10,830,000,000
United States	3,838.657,000,000	2,301,000,000	37,220 000,000
France	17,583,000,000	1,140,000,000	?
China	995,587,000,000	—	?
Japan	7,970,000,000	—	235,000,000

Remarks:—The figures for coal have been quoted from the statistics presented to the International Geological Conference, Canada; and those for iron from the data presented to the International Geological Conference at Stockholm.

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In China, South America, etc., the prospecting work has been conducted far from thoroughly. However, from all the material at command, the United States is possessed of two-thirds of the world's coal, while Great Britain has 24% of the coal of Europe.

As regards iron, there are still countries like Germany, for instance, which await the prospecting work to be completed. However, at present the United States holds 22% of the world's aggregate visible reserve, in addition to 62% of the world's potential reserve. Great Britain has only 9.6% of Europe's visible reserve, besides 4.5% of the world's potential reserve. As for Germany, prior to the War, she held 55% of Europe's coal wealth and 25% of its iron hoard.

It goes without saying that war is not fought only on the field in the present age, but is seriously influenced by the capacity of manufacturing munitions. Germany apparently fully appreciates what an important bearing iron and coal have upon the future of her destiny, not to mention the issue of a war, and seems to be contriving to acquire the control of the coal and iron resources of Europe at the first opportunity.

That Germany, soon after the outbreak of the Great War, took possession of the coal fields in Northern France and Belgium, and the iron beds in Lorraine on the west, and the Tombroa (?) coal belt and the oil fields in Roumania on the east, thereby practically controlling the iron and coal situation of Europe, and it was this virtual control, according to many competent critics, that imparted to Germany the endurance and strength to keep up the colossal struggle during the five long years. From this consideration, the lightning dash, with which the Germans took Liege by storm and laid siege to Verdun, should be appreciated as strokes of profound significance, both economically and strategically.

The present day world may be said to lie under the control of coal and iron in peace as well as in war. Therefore, it may well be said that the destiny of a nation largely depends upon the supply of these twin essentials.

Coal Question in Japan.

Turning to Japan, the aggregate estimated coal hoard of Japan is put at 8,000,000,000 tons, of which 3,500,000,000 tons are estimated to be minable, according to Mr. Ishiwata (an authority on the coal situation). The coal

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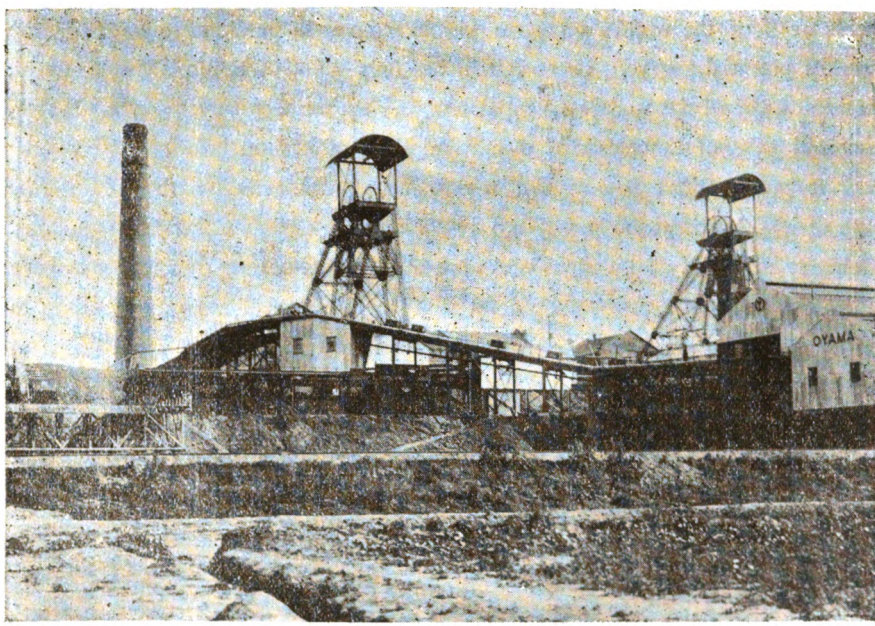
consumption is expected to be doubled by 1928, compared with 1921, and to increase by 70% in the course of the succeeding ten years. Putting the rate of further increase for each succeeding decade at 50%, the above mentioned aggregate hoards are estimated to be quite exhausted in the comparatively short span of about thirty-five years.



OYAMA PIT, FUSHUN COLLIERIES.

Iron Question in Japan.

The prospect is indeed gloomier for Japan concerning iron. Out of 680,000 tons of iron ore wanted in the fiscal year 1917, only 34.6% thereof, or 260,000 tons were put out in Japan, and combined with what was produced in Chosen, the sum total amounted to no more than 56%. The iron and steel imported from abroad and manufactured at home during the same fiscal year, if converted in calculation into iron ore, would be equivalent to 3,560,000 tons of iron ore, of which the domestic outputs occupied only 7.3% and, together with the outputs in Chosen, 10%.

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The domestic iron hoard of Japan, according to the report of Dr. Inouye, Superintendent of the Geological Institute of the Department of Agriculture and Commerce, Tokyo, is placed at 55,000,000 tons, the iron sulphide ore hoard at 10,000,000 tons, making the total of 65,000,000 tons. If Dr. Ohkohchi's statement that the demand for the above ores will be doubled in the course of every ten years is to be depended upon, and if the wants of our country were to be met with the domestic outputs, the above hoards would be barely sufficient to last ten odd years hence. Even adding 170,000,000 tons of these ores in Chosen Peninsula, the natural hoards would be exhausted some twenty years from now. Moreover, the above-mentioned calculations, it must be explained, have been made, leaving out of account the sharp rise of the mining cost.

Whilst, as observed above, the abundance and moderate prices of iron and coal are accepted universally as the fundamental essentials for the elevation of the modern economic life, the future of Japan's industries, thus haunted with the threatened extinction of both essentials in no distant future, is a matter of serious concern indeed. One of the burning questions of the present day Japan is: "How should this all important question be solved?"

Iron and Coal in Manchuria and China.

In Japan and her colonies, there is only a meagre supply of petroleum available as a substitute for coal. As to water power, there exists quite plenty, although not by any means unlimited. In Chosen, one of the colonies, the natural bounty in the line indicated above is very niggardly, and at present, there is scarcely enough to supply even the domestic wants in the Peninsula.

What can Formosa contribute in the matter of the twin essentials—iron and coal? Kabafuto (Lower Saghalien) seems to hold out a good promise, but the question remains how much relief we may look to Formosa for.

Talking of iron, it lies completely under the jurisdiction of other countries. The bitter lesson we learned at the hands of the United States, when she prohibited the export of iron, must be still fresh in our memory. Must we then accept despair as our sad lot after all? We may still venture to answer in the negative to the above question. We have Manchuria and China to reckon with. Manchuria, which contains Fushun Collieries and the Anzan Iron & Steel Works, etc., offers

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a means to solve the knotty iron and coal problem and sheds a bright ray of hope.

It is true that the iron mines of Anshan, although they yield a more or less poor ore, hold as much as 400,000,000 tons of such ore above the surface of ground only.

When the ore-concentration arrangements now under consideration are completed, the future of the Anshan Mines will be of a rosy hue indeed. The original plan to raise the annual output of pig iron to 1,000,000 tons may yet be realized, and that not at all in the remote future.

The Fushun Collieries seams are estimated to consist of 1,000,000,000 tons. Reckoning the annual outputs at 3,000,000 tons of coal, those Collieries may stand the exploitation of two hundred and fifty years longer.

Furthermore, in the west of the Liao, there are a good number of collieries like Hsinchiu and others, many of which still remain unprospected.

Manchuria as seen by Prof. Stevenson.

Prof. Stevenson, of the University of London, has recently published an interesting observation with reference to the Japanese activities in Manchuria substantially to the following effect:—

"A promising future is in store for the Japanese activities in South Manchuria. The one question is: How will Japan direct her sundry activities in tapping the potentialities of South Manchuria? I shall for one follow carefully with keen interest how Japan and the Japanese will carry on their operations during the next ten years."

Needless to state, Japan acquired her foothold in Manchuria in consequence of the successful war against Russia whose southward aggression she was compelled to check to ensure her own strategic and political security. On the lapse of fifteen years, South Manchuria has become an indispensable factor for building up the industrial Japan. The outputs of the Fushun and other collieries in South Manchuria are available for the dual purpose of the motive power for opening up Manchuria and also of helping to solve the fuel problem of Japan.

As above stated, the coal and iron mining industry in South Manchuria is the first step for settling satisfactorily the raw material issue of the industrial Japan.

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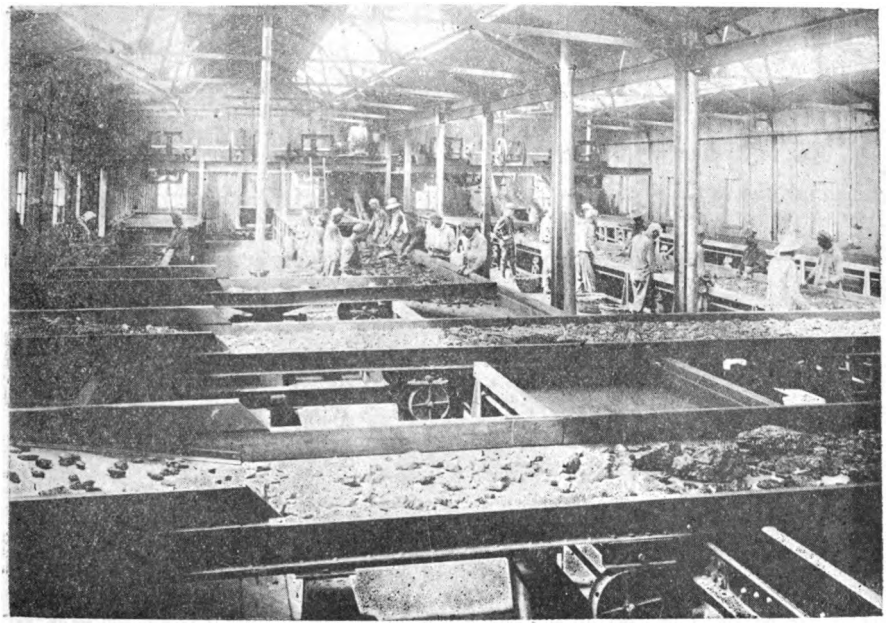
Fushun Coal and Enlightenment of Manchuria.

In Manchuria with its intensely cold winter and scantily provided with fuel material, coal constitutes one of the absolute necessaries both for living and industrial development.

On this account, the increase of demand for Coal in Manchuria is an indicator of the progress of enlightenment in Manchuria.

The demand for Coal in Manchuria and Chosen had grown about ten times as large by the fiscal year 1919 as in 1909 (dating back ten years), in which year the South Manchuria Railway Company took over management of the



COAL SCREENING PLANT, OYAMA PIT, FUSHUN COLLIERIES.

South Manchuria Lines. Compared with 1911, the figures for 1919 proved about fourfold. The increase in the local sales in South and North Manchuria reached about fivefold in the course of eight years between 1911 to 1919. The coal used by the South Manchuria Railway Company itself increased also about five times, whilst, with ships' bunkers, the rate of increase was three and half times.

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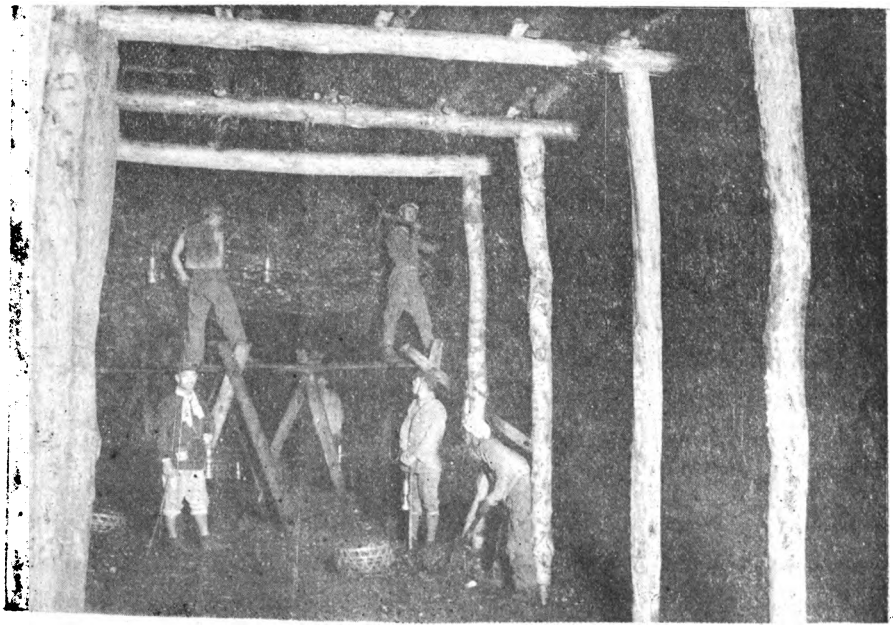
On the contrary, the export of coal reached its zenith in the fiscal years 1913 and 1914, falling down in volume by degrees to the lowest figures of 280,000 tons in the fiscal year 1919.

The above mentioned rates of increase tell tales of the enlightenment and development of Manchuria better than anything else. In a word, it has been this fuel supply that has raised South Manchuria to what it is to-day.

Of the coal supply for consumption in Manchuria, Fushun coal took up 88% in 1914 preceding the outbreak of the great War, decreasing to 68.5% in the fiscal year 1919, which necessitated the import of Japanese and Kailan (of the Kailan Mining Administration) coals to the extent of 540,000 tons, in order that the shortage might be made up.

Future of Fushun Collieries.

The rapid increase of the coal demand in recent years has even hazarded the self-supplying capacity of Manchuria. When the further increase of demand bound



MINING WORK IN YANGPAIPU PIT, FUSHUN COLLIERIES.

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to follow the possible expansion of the Anzan Iron and Steel Works is taken into reckoning, the outlook looks really dismal.

Therefore an extensive mining plan has been drafted with a view to raising by 1931 the annual outputs to 11,000,000 tons, the maximum yield accepted as within reach of human exploitation at the present stage of the progress of science.

In dealing with a coal seam like that of the Fushun Collieries, which has at places a thickness of 400 ft. and lies only 40 ft. under the surface of ground, the most businesslike plan of mining is believed to be the open cast system in order to realize the triple requirements—expeditious mining, reduction of mining cost, and increase of outputs. A proposition to strip the earth to the extent of 190,000,000 cubic *tsubo* (1 *tsubo* being 36 square feet and 1 cubic *tsubo* being 216 cubic feet), inclusive of the site of the present Railway Town of Fushun is now under investigation.

The earth to be stripped on the above plan is estimated to be five times as much as that excavated in the construction of the Panama Canal. Where the coal seam runs deeper in the earth, the sand-flushing method must be resorted to. Then, the coal seam is overlapped with layers of oil shale. The magnitude of the oil shale is not large by any means, but the oil shale itself awaits exploitation as material for extracting petroleum from.

The open cast system, the sand flushing method, and the utilization of oil shale are the three problems, on which the finest scientific and engineering intellect of Japan is being strained to the full so as to elevate the operation of the great Fushun Collieries to a most ideal plane.

A fair idea of the present and future of the Fushun Collieries may be obtained from the following notes and tables:—

Coal Supply and Demand in Manchuria.

Unit: 1,000 tons.

Coal outputs of Manchuria	1908	1910	1914	1915	1916	1917
Fushun Coal	490.7	898.4	2,147.4	2,169.2	2,039.5	2,275.9
Other coals	—	45.9	419.3	430.9	483.3	643.7
Total	490.7	944.3	2,566.8	2,602.2	2,522.8	2,919.6

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Unit: 1,000 tons.

Coal outputs of Manchuria	1908	1910	1914	1915	1916	1917
Demands						
For use of S.M.R. Co.						
Fushun Coal	275.6	286.3	481.7	484.2	462.2	614.1
Other coals.....	—	10.7	98.1	93.8	117.9	137.6
Imported coals ...	—	26.8	—	—	0	3.7
Total	275.6	323.9	579.8	578.0	580.1	755.6
Local sales						
Fushun Coal	130.0	301.4	539.3	618.3	703.9	779.5
Other coals	—	34.6	140.6	256.2	329.3	393.1
Imported coals ...	—	10.9	—	—	—	—
Total	130.0	347.1	679.9	874.7	1,033.3	1,172.6
Exports						
To Chosen						
Fushun Coal	2	71.1	208.0	247.5	291.1	344.1
Other coals.....	—	2	2.2	4.1	4.6	7.5
Imported coals ...	—	15.8	—	—	1.3	10.1
Total	2	86.9	210.2	251.7	297.1	361.8
To Abroad	1908	1910	1914	1915	1916	1917
Fushun Coal	20.4	237.4	717.0	482.0	592.7	413.0
Other coals	—	1	143.7	80.2	39.0	25.1
Imported coals ...	—	—	—	—	9.1	27.0
Total		237.5	860.7	562.2	640.8	465.1
Bunkers						
Fushun Coal	16.6	49.6	226.7	186.2	181.8	161.1
Other coals.....	—	0.4	0.3	10.2	0.7	5.3
Imported coals ...	—	1.8	—	—	—	6.4
Total	16.6	51.8	227.0	196.5	182.5	173.0
Grand Total Demands						
Fushun Coal	443.0	946.0	2,172.8	2,018.6	2,231.9	2,312.0
Other coals.....	—	45.9	385.1	444.7	491.7	568.9
Imported coals ...	—	55.4	—	—	10.5	47.4
Grand Total	443.0	1,047.4	2,557.9	2,463.4	2,734.1	2,928.4

Coal outputs of Manchuria	1918	1919	Rates of Increase 1908–1919	Annual average increase	1915–1919	Annual average increase
Fushun Coal	2,521.1	2,762.6	2,075	230	276	069
Other coals	681.5	668.8	—	—	—	—
Total	3,202.6	3,431.5	2,633	292	319	079

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Unit: 1,000 tons.

Coal outputs of Manchuria	1918	1919	Rates of Increase 1908–1919	Annual average increase	1915–1919	Annual average increase
Demands						
For use of S. M. R. Co.						
Fushun Coal	865.8	1,340.2	3,678	408	1,768	442
Other coals	158.2	111.4	—	—	—	—
Imported coals ...	8.4	166.8	—	—	—	—
Total	1,032.4	1,618.5	3,995	444	1,799	449
Local sales						
Fushun Coal	900.2	1,012.2	2,364	262	638	159
Other coals.....	526.3	593.1	—	—	—	—
Imported coals ...	—	164.9	—	—	—	—
Total	1,446.5	1,770.4	4,100	455	1,023	255
Exports						
To Chosen						
Fushun Coal	397.9	156.2	1,197	133	369	092
Other coals.....	3.2	0.3	—	—	—	—
Imported coals ...	55.9	59.8	—	—	—	—
Total	457.2	216.3	1,480	164	140	035

To Abroad	1918	1919	Rates of Increase 1908–1919	Annual average increase	1915–1919	Annual average increase
Fushun Coal	339.6	195.8	174	019	593	148
Other coals.....	38.8	34.6	—	—	—	—
Imported coals ...	2.0	52.4	—	—	—	—
Total	380.5	283.0	191	021	496	124
Bunkers						
Fushun Coal	135.9	83.7	685	076	505	126
Other coals.....	3.1	—	—	—	—	—
Imported coals ...	93.1	100.4	—	—	—	—
Total	232.3	184.2	2,550	282	062	015
Grand Total Demands						
Fushun Coal	2,639.6	2,788.2	1,947	216	381	095
Other coals.....	729.9	739.6	—	—	—	—
Imported coals ...	159.6	544.6	—	—	—	—
Grand Total ...	3,529.1	4,072.5	2,882	322	653	163

II. Brief History and Rough Review.

Coal mining at Fushun dates from 600 to 700 years back when, in the Liao-Chin reign, a number of Koreans came to Fushun to mine coal for the manufacture of pottery.

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Subsequently, the Moguls rose and fell. Under the Manchu Dynasty, the mining work was prohibited on account of the proximity of Fushun to the tombs of the Imperial Ancestors. The Peking (Manchu) Government, awakening to the profit of mining the coal, withdrew the ban in 1901 and gave permission to some Chinese to operate the collieries.

It was in about 1903 that the Russians, who were then in the ascendancy in North and South Manchuria began to cast longing eyes upon the Fushun Collieries. They started to invest capital in the management of the mines. In 1904, they constructed a railway and subsequently opened hostilities with Japan. On March 10, 1905, the Japanese Army, which was on that day in the very thick of the successful Battle of Mukden, took possession of the Fushun Collieries. The Army opened a mining office and soon afterwards set about a semblance of an organized mining under the directions of the Mining Corps of the Japanese Field Railway Paymasters' Department.

South Manchuria Railway Company.

On April, 1907, on which date the South Manchuria Railway Company took over management of the railways ceded to Japan by Russia, which have been styled the South Manchuria Railway Lines, the Railway Company also assumed management of the collieries at Fushun, Yentai, and Chatzuyao, and in July of the same year, the two minor collieries at Taochiatun and Shihpeiling were taken over also from Russia in terms of the Russo-Japanese Railway Agreement.

Of the above mentioned collieries, both Fushun and Yentai have lain under management of the South Manchuria Railway Company and the Chatzuyao colliery (in fact an insignificant ore) of a private Japanese; whilst the collieries at Taochiatun and Shihpeiling were entrusted to the management of the South Manchuria Mining Co., Ltd., a Japanese corporation, in 1918.

First Stage of Fushun Mining Plan.

At the time when the Railway Company took over the Fushun Collieries, they were worked only on a small scale, and between the three pits at Chienchinchai, Yangpaipu, and Laohutai, the daily outputs totalled only 360 tons. When the late Dr. B. Matsuda took up his duties as the first Superintendent General of the

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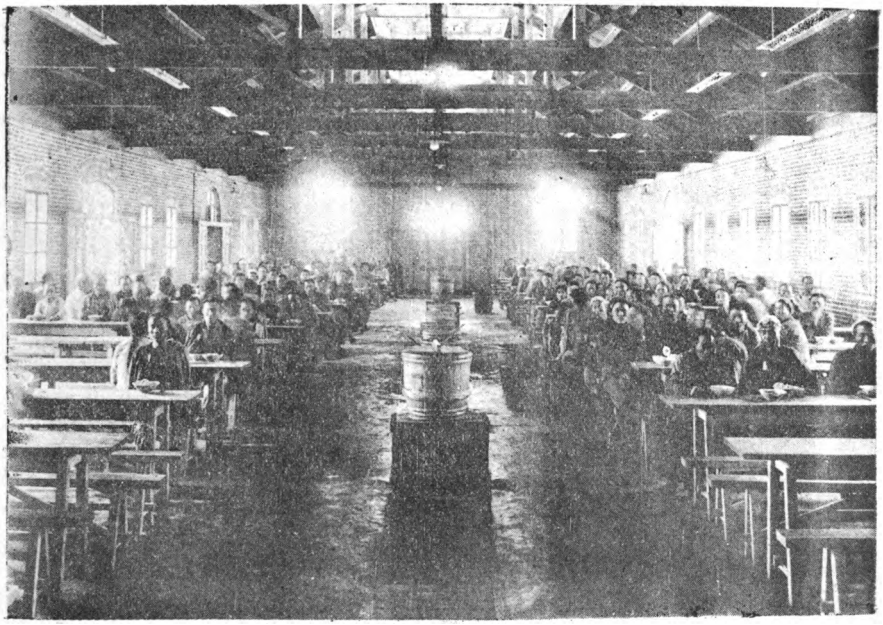

CHINESE MESS ROOM, TOGO PIT, FUSHUN COLLIERIES.

Collieries, the energetic and experienced expert drafted what is known as the plan for the First Stage of Fushun Coal Mining estimated to cost Y9,200,000. The same plan had as one of its prominent features the excavation of two extensive shafts at Chienchinchai and Yangpaipu. The two shafts were completed in 1911 and were respectively named Oyama and Togo Pits. Sundry improvements were introduced in other directions, and the daily outputs were raised to 5,000 tons.

Second Stage of Fushun Mining Plan.

The Second Stage of Fushun Mining Plan was entered upon. On the death of Dr. Matsuda (the successful organizer and first Manager of the collieries) in 1911, Dr. S. Yonekura succeeded the deceased in July of the same year.

The chief items of enterprises carried out during this stage were as follow :—

1. Completion of excavation of an incline at Wantawu (commenced in April, 1914, and opened to operation in April, 1915).

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2. Open Cast at Kuchengtzu:

As already mentioned, owing to the unparalleled thickness of the Fushun Coal seam, the most commendable plan of mining is to work the portion at comparatively shallow depths on the open cast system and the rest at greater depths on the sand-flushing system.

The coal seam about Kuchengtzu is located at the western edge of the coal belt and is 400 ft. thick, and only 40 ft. from the surface of ground. On this account, it was decided to be operated on the open cast system. Work was begun in April, 1914, and was opened to business working in April, 1915.

3. Sandflushing method was introduced first into Yangpaipu Pit in 1912, and was extended to Oyama, Togo, Laohutai, and Chienchinchai Pits.

4. Construction of Mond Gas Producers' Plant:

Since Fushun Coal contains a comparatively large percentage of nitrogen (the percentage ranging from 1.3 to 2.9%), it was planned to extract the nitrogen for the manufacture of sulphate of ammonia, besides procuring such bye-products as pitch, tar, naphthaline, etc., with the object of bringing down the expenses for the motive power. Consequently, the Mond Gas Producers' Plant was founded, it being completed in March, 1915.

5. Coal-carrying sidings and electrization of sand-gathering sidings:—

Both coal-carrying and sand-gathering railway sidings at and about Fushun were electrized so as to expedite the work of transportation. The work was effected by October, 1914.

6. Excavation of an incline at Lungfeng:

Lungfeng is located near the eastern end of the mining zone. It gives coal of fine quality suited to the manufacture of cokes, of which a large quantity is in demand at the Anzan Iron & Steel Works. The excavation of an incline was begun in April, 1917, being raised to business working order in September, 1919.

7. Open Cast at Chienchinchai:

In order to meet the quickly increasing demand in consequence of the Great War, a new open cast was initiated at the west of the Chienchinchai Pit.

8. The excavation of another incline was started in May, 1918. It was opened to business working in April, 1920.

Through the introduction of all these enterprises, the total daily outputs were increased to about 7,000 tons a day by the fiscal year 1918.

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Third Stage of Fushun Mining Plan.

The Great War inflated also the economic activities in Manchuria and Chosen, substantially increasing the population. Many fresh industrial ventures were launched afresh in these regions, making it imposible for Manchurian coals to fill the rapidly rising requirements. To make up for the shortage, it was necessary to import 150,000 tons of coal in the fiscal year 1918 and 490,000 tons in the following fiscal year, 1919.

The possible increase of demand in Manchuria and Chosen, particularly by the Anzan Iron & Steel Works, had to be considered, and under these circumstances, what is designated as the Ten Year Programme was drawn up in 1919.

On the resignation of Dr. S. Yonekura (Superintendent-General of the Collieries) at the end of 1919, Viscount T. Inouye (Professor of the Imperial University, Tokyo) succeeded him as Acting Superintendent-General, additionally holding the Superintendency-General of the Anzan Iron & Steel Works.

The details of the Ten Year Programme will be given in a later edition. Its ultimate object lies in contriving a quick increase of the outputs so as to meet all possible contingencies and in effecting as much saving of mining cost as will be practically possible.

It was agreed that, in order to realize the above mentioned aims, the two existing open casts at Kuchengtzu and Chienchinchai should be connected and operated as one, and that the stripping operation should be extended further to the present site of the Railway Town of Chienchinchai, that three new extensive shafts should be excavated, so that by 1929 the annual outputs may be increased to 8,000,000 tons (inclusive of 3,400,000 tons from the open cast, which will be 46% of the total yield), and that twenty years hence, that is, by 1939, the annual total may be increased to 11,000,000 tons.

The first steps taken in the above direction are the extension of the Chienchinchai open cast and the excavation of the Lungfeng pit.

Producing Capacity of Fushun Collieries.

As above stated, the Fushun Collieries are being operated by means of two open casts, two shafts, and six inclines, putting out amongst them some 10,000 tons a day.

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To cite an instance, the daily outputs on April 14, 1920, were as under:

		Tons
Kuchengtzu Open Cast Zone	Kuchengtzu	1,638
	Chienchinchai	1,179
Oyama Mining Zone	Chienchinchai	1,519
	Oyama	2,033
Togo Mining Zone	Togo	999
	Yangpaipu	1,693
Laohutai Mining Zone	Laohutai	1,344
	Wantawu	684
Lungfeng Mining Zone	Lungfeng	516
	Hsintun	135
	Total	11,742

The following gives the annual outputs of the different pits from 1907 down to 1919, the unit being 1,000 tons:—

	Open Cast No. 1	Open Cast No. 2	Chienchinchai	Oyama	Togo
1907...	—	—	103.3	—	—
1908...	—	—	238.8	—	—
1909...	—	—	324.1	0.1	—
1910...	—	—	370.4	14.4	17.4
1911...	—	—	404.9	186.4	146.6
1912...	—	—	384.8	359.9	252.0
1913...	—	—	579.5	421.1	414.9
1914...	2.1	—	683.6	235.0	472.2
1915...	102.7	—	623.1	301.6	430.4
1916...	173.5	—	572.3	305.2	170.8
1917...	272.3	0.2	602.7	135.7	291.4
1918...	260.7	66.8	486.0	328.2	319.5
1919...	231.3	300.4	307.6	406.4	319.5

	Yangpaipu	Laohutai	Wantawu	Hsiutun	Lungfeng	Total
1907...	64.5	65.5	—	—	—	233.3
1908...	127.3	124.6	—	—	—	490.7
1909...	176.1	192.7	—	—	—	693.2
1910...	217.8	279.0	—	—	—	899.2
1911...	301.6	285.0	—	—	—	1,324.5
1912...	219.2	261.5	—	—	—	1,471.1
1913...	290.7	473.0	—	—	—	2,179.2
1914...	381.8	420.1	—	—	—	2,149.8
1915...	471.8	179.4	53.4	—	—	2,162.6
1916...	499.1	257.8	65.6	—	—	2,044.4
1917...	598.0	295.5	110.7	—	5.1	2,311.4
1918...	501.5	393.7	157.0	—	74.5	2,521.2
1919...	454.7	405.0	164.7	18.1	155.2	2,762.7
Grand total ...						21,242.3

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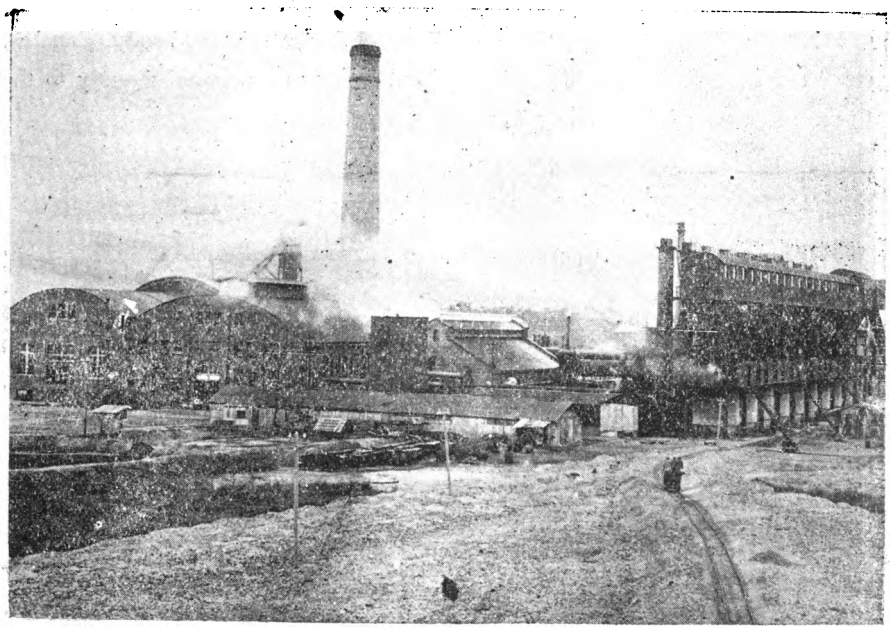
Location, Topography, and Geology of Fushun Collieries.

Fushun Collieries are located at about 23 miles east of Mukden, and Chienchinchai in the western part of the Fushun Coal Belt is situate at 33 miles northeast of Suchiatun Junction at which the branch line to Fushun Collieries deviates from the Main Line of the South Manchuria Railway Lines. At Chienchinchai, the Colliery Town is located. More correctly speaking, the central location post in front of the General Offices of the Fushun Collieries stands at 41° 58′ N.L. and 124° 6′ E.L. and above 276 ft. above the sea-level. It is 266 miles distant to Dairen, 193 miles to Antung, and 202 miles to Yingkou (Newchwang).

Colliery Town of Fushun.

Dr. S. Yoshino (Professor of the Imperial University, Tokyo) is said to have once remarked that the Fushun Colliery Town is a miniature of the Town of Jena. Since it is the Colliery Town, the Colliery Offices and the residences



MOND GAS PRODUCER FACTORY, FUSHUN COLLIERIES.

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of the Company's officials and employees, together with the Primary School, the Colliery Hospital, the Colliery Club, the Assembly Hall, the Colliery Library, etc., make up the principal buildings. In recent years, stores and shops of different kinds have been opened, but not a street is remarkable for dense traffic. Each street has a vehicular road with a sidewalk on each side lined with shade trees such as acacias, poplars, elms, etc.

In early summer, when these shade trees wear a verdant foliage, through which glimpses of red brick buildings may be caught, and the sweet scent of the white acacia flowers fills the streets, even the crude Colliery Town lends itself some charming air which may appeal to visitors.

Walled Town of Fushun.

The River Hun runs along the north of the Colliery Town of Fushun. About 3½ miles northeast on the other side of the River, there stands the walled town of Fushun, which, tradition says, was one of the frontier strongholds raised under the Sung Dynasty against the depredations of the Chins. The walls crumbled at places and are generally in bad repair. The towers over the walls have become dilapidated. There are still inside the walls the barracks, schools, library, churches, etc. The Prefect's Yamen, the police station, etc., were removed recently to the Chinese Quarter of the Colliery Town of Fushun.

River Hun.

The River Hun has its head among the mountains near Hsingking situated to the east of Fushun. For some fifty miles or so, it gathers petty tributaries and run down the narrow defiles and gorges. The valley considerably gains in size rather abruptly near Tachiapang situated about ten miles east of Chienchinchai. At that point it is about three and half miles in width, still further expanding as it goes west, connecting with the great plain about Mukden.

Fushun Mining Zone.

The Fushun mining zones lie in this valley, stretching from east to west on the south bank of the Hun River. On the east of the mining zone runs the

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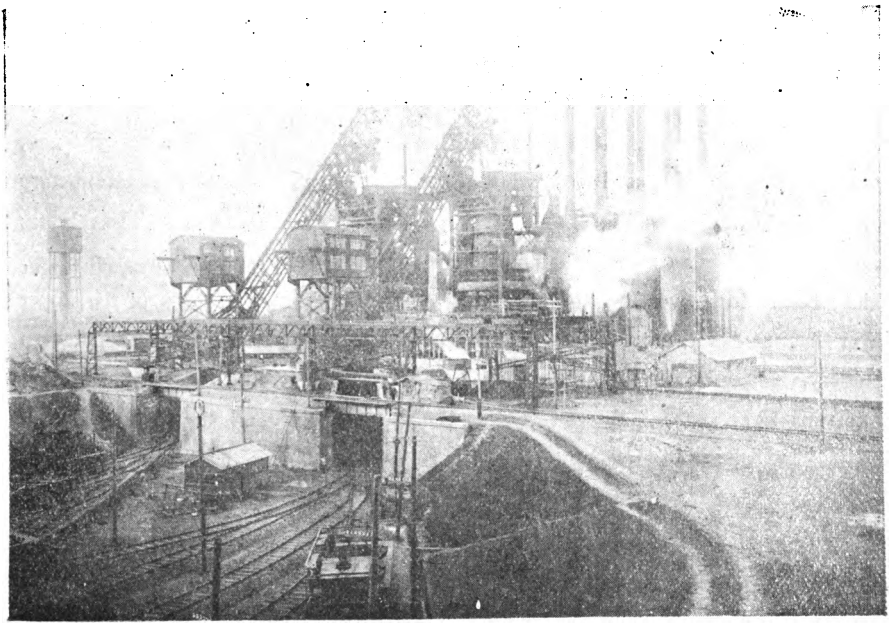
Tungchou River, a tributary of the Hun, and on the west the Kuchengtzu, another tributary of the Hun. The mining zone is about ten miles from east to west and about two miles from north to south.

From the top of Senkindai (an eminence rising on the south of the Colliery Town) one may command a fine view of the Hun Valley. In the east, a range of hills is seen undulating and zigzagging. This range of hills marks the southern boundary of the Fushun mining zone. Near Laohutai in the centre of the mining



BLASTING FURNACES, ANZAN IRON & STEEL WORKS.

zone, the same range sharply takes a northern direction. This geological feature was caused by the extensive fault running from north to south. This same range may be likened to a pillow for the great coal seam. These hills are constituted of basalt wholly, and on the north side, facing the Hun River, the coal seam has the uniform dip of about 30°.

The enormous coal hoard estimated at 1,000,000,000 tons lay quiet and unnoticed on the bed of basalt, covered with layers of rocky formations. Thus the hoard had lain dormant for billions of years, until the outcrops showing above

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ground at several points betrayed at length the existence of the subterranean wealth and led to human exploitation.

Geological Structure.

The geological structure of Fushun and environs is composed of hornblende gneiss, which bears a resemblance to both ignious rock and sedimentaryrock, is supposed to have been formed on the "second day of the creation."

Lower Layers of Coal.

In the tertiary period of the Cainozoic Era, such layers as those of tuff, sandstone, conglomerate, and shale are supposed to have been brought into existence, and the district is supposed to have been turned into a lake. The lower structure has a couple of thin coal layers running one over the other through it. These layers are called the lower coal-bearing series, the upper 20 ft. thick and the lower only 2 ft. thick, being from several feet to dozens of feet apart. There are traces of the upper layer having been mined from olden times, and such minor mines as Piaoerh Colliery, Hsiaopiao Colliery, Huasheng Colliery, and a few others are being worked upon this layer.

Chief Coal Layers.

The geological layers were organized one after another in the abovementioned order, completing the earth's crust. Animal life became propagated steadily. The mammals, in particular, were developed wonderfully. In the mean time, the volcanoes were active, and about Fushun, too, there occurred volcanic eruptions, pouring out lava and turning the country into a veritable hell. It was this lava that became basalt, which overlaps the lower coal measures. Again, pozzuolana settled down into tuff.

These layers were overlapped in turn by others of shale and sandstone, and then in the course of millions of years, the herbage, driftwood, fallen trees, etc., were heaped and buried under ground. Under the high pressure and strong heat, they became completely carbonized, thus the principal coal layers of the Fushun coal seam, which has no parallel in the world in point of thickness, came to be formed.

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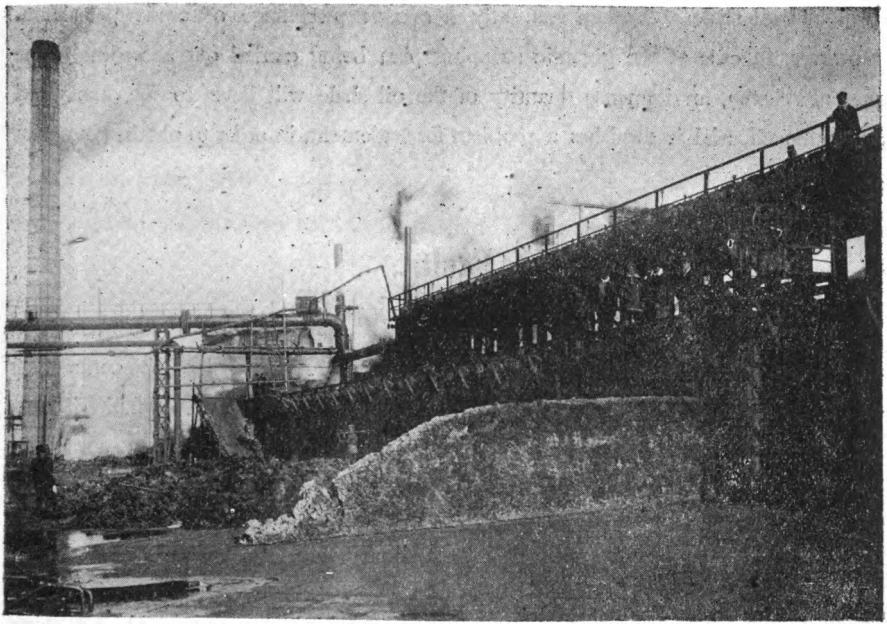

COKE OVENS ANZAN IRON & STEEL WORKS.

Fushun Coal Layers.

The Fushun coal seam is 78 ft. thick near Lungfeng Pit, inclusive of 31 ft. of parting, where it is the thinnest, while directly underneath the Colliery Town of Chienchinchai, where the seam is the thickest, it is 426 ft. in thickness, inclusive of 19 ft. of parting. The mean thickness of 150 ft. (inclusive of 20 ft. of parting) is found at Laohutai. The contrast with the coal seams in Great Britain, the United States, and Germany, which range from only 2 to 10 ft. in thickness, is indeed striking.

Oil Shale.

Over the coal seam, a layer of shale of brownish colour, about 300 ft. thick, was formed, and this is in turn overlapped with a still another layer of shale of greenish colour and of remarkable thickness (measuring 450 ft. on an average in thickness). It is this oil shale that has acquired much importance as material for extracting crude petroleum from, for instance, in the United States owing to the short supply of kerosene in recent years.

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The oil shale at Fushun has only a meagre percentage of crude petroleum. However, in case of the gigantic stripping plan being carried out according to the present scheme, an immense quantity of the oil shale will have to be excavated and removed, and it furnishes a problem for settlement, in order to obtain petroleum therefrom.

Faults.

The organization of the earth's crust progressed in good order as mentioned above, and finally a noteworthy accident happened. As a result of the contraction of the earth's crust, in the centre of the great coal field, a crack or fault of considerable dimensions was created from east to west.

Presumably through the strong pressure on both sides of the coal seam, its central part became pushed up, and it was possibly from some weakness caused by a development in the due order of the geological structure, that the northern part of the seam was pushed up abruptly, whilst in the south the seam dipped northward at about 27°. There was perhaps coal in the northern half of the seam, but now only the lowest layer of gneiss is exposed, and there is no trace of coal, which might have been either washed away or have eroded.

The southern half of the coal seam has fortunately been protected. Since basalt, in its nature, has a great resistant power against weathering, it has been left as a line of hills bounding the southern fringe of the coal field. The coal seam itself, together with the shale layer, is overlapped by the diluvium formed by the Hun River, in the Quaternary Period, which consists of clay and alluvium being from 30 to 80 ft. in thickness.

Magnitude of Coal Hoard.

The approximate dimensions of the Fushun Coal seam have been ascertained by technical estimation, according to which the scum extends from east to west beyond the limits of the Fushun Colliery Zone, whilst on the south it starts from the foot of the basalt hill and extends in width from 1 mile to 1½ miles. None is found to exist on the bank of the Hun other than above mentioned. The coal hoard in this zone is estimated at about 1,000,000,000 tons.

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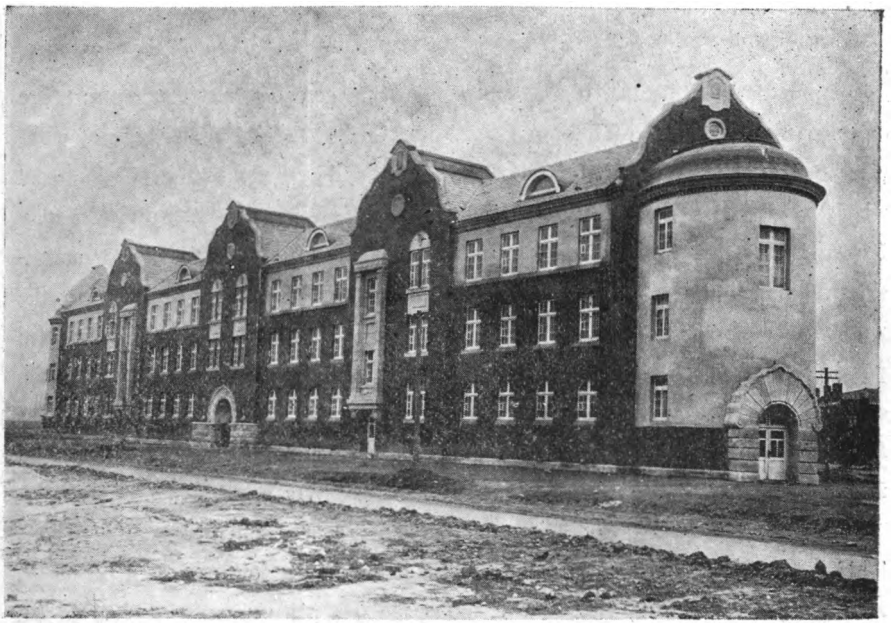
Quality of Fushun Coal.

Fushun Coal is practically uniform in quality. As it proceeds eastward up to Lungfeng Pit from the west of Kuchengtzu and Chienchinchai, the coal is found to gain in coke, nitrogen, and ash, whilst it loses in volatile matter. Near Chienchinchai, an extremely hard coal, often called "Kabari," is met with in parts



BACHELORS' QUARTERS, ANZAN IRON & STEEL WORKS.

of the seam. "Kabari" is used as material for carving, and figures of popular fairy saints, flower-pots, etc., are carved in the lustrous jet-black coal and are on sale, commanding a pretty brisk demand as souvenirs to visitors to the Colliery, Orientals and Westerners. In some parts of the seam, the coal contains much amber, and the Chinese handicraftsmen turn out medicine cases, seal-cases, and like knickknacks. This particular kind of coal is known to have been carbonized from coniferae. Occasionally, small pieces of pirite are noted to be fastened to the cleaven part of coal. About Kuchengtzu, siderite is mined and makes a material for iron manufacture.

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Result of Latest Analysis.

The result of the latest analysis of Fushun Coal is as follows:—

	Water	Volatile matter	Fixed carbon	Characteristic of coke	Ash	Colour of ash
Maximum	3.25	43.01	51.89	Slightly expansive Caking	18.5	Yellowish
Minimum	5.84	33.96	42.90	Caking	17.30	Greyish
	Sulphur	Nitrogen	Calorific power			
Maximum	0.81	1.38	7.750			
Minimum	0.46	1.21	6.170			

From the above table, it may be seen that the comparatively larger percentage of water is a drawback of Fushun Coal, which lowers the calorific efficiency compared with the weight. It also interferes a little with the combustion of dust coal which has become quite a popular usage lately. However, the latter difficulty may be surmounted by means of the drying appliances. Next, Fushun Coal was considered as falling short of caking property, which renders it unsuited to the manufacture of coke for the smelting furnace of a steel works. Luckily, a coal possessed of a good amount of caking property has been found to occur in the eastern part of the coal seam, and this coal has proved very acceptable. It was for this reason that the two pits of Lungfeng and Hsintun were excavated recently in order to supply coke to the Anzan Iron & Steel Works.

Another characteristic of Fushun Coal is that it is rich in volatile matter. This facilitates combustion and adapts Fushun Coal to various uses. In particular, as a gas producing coal, Fushun Coal takes the first place among its likes in all the Orient.

Again, the fact that Fushun Coal contains an unusually large amount of nitrogen suggested the profitability of recovering ammonia by establishing a Mond gas-producer plant. During the Great War, the Fushun Collieries Management could operate twenty generating furnaces on the Mond system and fourteen others on the Limm system so as to put out sulphate of ammonia in a large quantity as a bye-product, while generating electric power.

Last but not least, Fushun Coal has still another advantage in that the ash percentage is comparatively low. The percentage seldom goes above 4 or 5%.

It may be counted as still another advantage that the clinkers stick to the grate of the boiler but little, necessitating very small trouble in cleaning the boiler.

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Then, the contents of sulphur which does most harm to the boiler are extremely small.

Coal is classified according to the percentages of fixed carbon, water, volatile matter, calorific power, etc., into anthracite, semi-anthracite, bituminous coal and lignite of different degrees.

Fushun Coal may be placed between bituminous coal of medium and low degrees.

HOW TO DISPOSE OF POOR ORE.

By Viscount T. Inouye.

There exists in Japan, Chosen, and Manchuria only a very small quantity of iron ore containing over 50% of iron, and the mining cost is none of the lowest. As to ore containing from 30 to 40% of iron, the subterranean hoard is enormous, and moreover the mining cost is very moderate.

To cite the instance of Anshan, the seat of the Anzan Iron & Steel Works under management of the South Manchuria Railway Company, in the area within the radius of ten miles with Anshan for the centre, the iron ore containing not less than 30% of iron, which lies on or above the surface of the earth is estimated at 400,000,000 tons at least. For mining the entombed wealth, all that is required to do will be to lop down the whole of the hill ranges. Judging by the costs of working the copper mines in Utah, U. S. A., and others, if operated upon a sufficiently extensive scale, the working cost for the Anshan mines may be brought down to the level of less than ¥1 per ton. Even adding the freight to the Iron & Steel Works, the cost is put at less than ¥1.50 per ton.

Talking of rich ore, containing more than 50% of iron, it is found to occur scattered here and there in the poor ore zones, a certain amount of difficulty being experienced even for putting out only 500 tons or so a day. Therefore, it will be next to impossible to lower the cost below ¥10 per ton.

The poor ore produced at Minette in Germany and the Cleveland Mine, England, contains only 30% or so, but the impurities consist of either lime or coal which facilitates the smelting process, and on this account, the comparatively meagre percentage of iron little stands in the way of utilizing it. However, when the impurities are composed chiefly of silicic acid, which more impedes the smelting

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process, the lower percentage of iron means the corresponding difficulty of smelting.

The study of samples of iron ore of Anshan, the increase of silicic acid percentage attendant upon the iron percentage is as indicated in the undermentioned table.

Note :—For the purpose of smelting, it is necessary to mix limestone in a quantity equal to about half the silicic acid contained in the ore, thereby further increasing the amount of the slag. Since slag ranks below 4/10 of iron in specific gravity, in the case of using ore containing 30% of iron, the slag will be more than ten times the bulk of the pig iron obtained. From the following table may be seen the varying quantities of coke and limestone consumed according to the varying quantities of silicic acid contained in the iron ore put out at Anshan, together with the amounts of slag and also pig iron obtainable :—

	Iron percentage	Silicic acid percentage	Coke ton	Per ton pig iron obtainable: Ore ton	Limestone ton	Slag ton
*1...	65%	6%	0.9	1.450	0.363	0.362
*2...	60	12	1.	1.565	0.557	0.568
3...	58	15	1.05	1.620	0.680	0.688
4...	56	18	1.10	1.678	0.835	0.828
5...	54	20	1.15	1.740	1.003	1.000
6...	52	21	1.20	1.840	1.173	1.170
7...	50	27	1.30	1.870	1.415	1.366
*8...	45	34	1.45	2.086	1.930	1.900
*9...	40	41	1.55	2.346	2.593	2.578
*10...	35	49	1.70	2.680	3.473	3.393
*11...	30	56	1.85	3.128	4.660	4.423

	Mean iron percentage	Parcentage of production efficiency
*1	52%	1.000
*2	44.2%	850
3	40.87%	785
4	37.41%	719
5	34.27%	659
6	31.51%	606
7	28.50%	548
*8	23.35%	449
*9	19.03%	366
*10	15.24%	293
*11	12.07%	232

Notes :—(A) The items marked * in the above table indicate imaginary ones.

(B) The mean iron percentage of the total admixture to the furnace in Europe and America (iron ore and limestone, the fuel being excepted) ranges from 23% to 43.7%, with the average of 36%.

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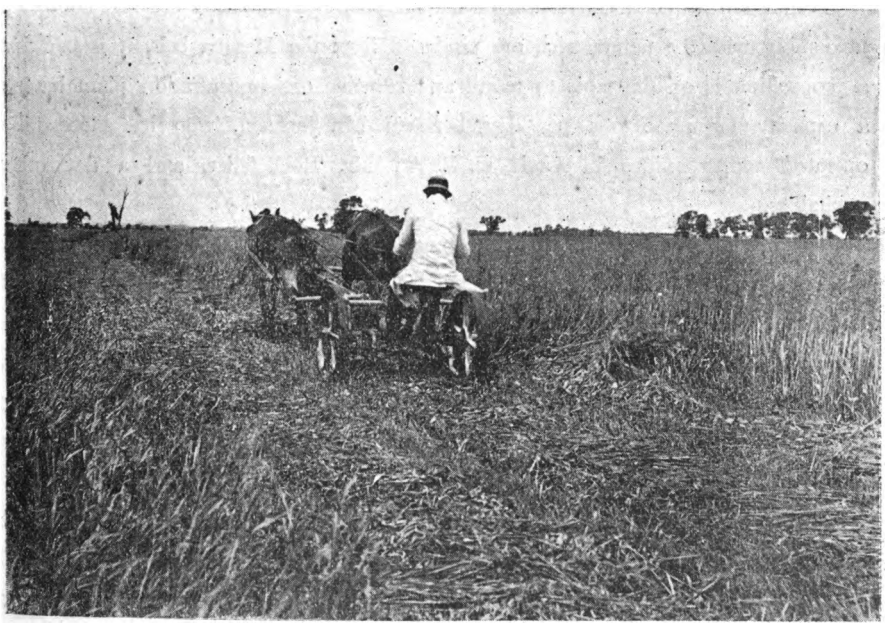
As may be seen from the above, the comparison of a rich ore, containing 60% of iron and 12% of silicic acid, with an imaginary poor ore, containing 30% of iron and 36% of silicic acid, will amply show what a striking margin there is in the production cost and labour, and moreover, with the poor ore, the exceedingly large quantity of the slag produced by the smelting process renders the smelting operation one of extreme difficulty. From this consideration, on the existing method of manufacture, with the price of iron and coal at the current quotations, the poor ore containing from 30 to 40% of iron is commercially unworkable as material for smelting purposes.

However, if, prior to admixture into the furnace, the iron percentage of the ore be raised above a certain point through some suitable process of ore concentration, the rich ore, into which the poor ore has been artificially converted, will acquire sundry advantages which are not always found in natural rich ore. These advantages will go to make up for part of the smelting expenses, and, coupled with the comparatively moderate mining cost, it may well compete industrially with natural rich ore.



S. M. R. Co. KUNGCHULING AGRICULTURAL EXPERIMENTAL STATION.

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Notes:—Such impurities as phosphor, sulphur, etc., existing in the country rock, will be automatically eliminated when the ore is crushed and the iron extracted. Also, it will be quite feasible to remove part of the obnoxious impurities while being made into ball ore, facilitating remarkably the smelting process, thereby saving the fuel and enhancing the productive capacity of the furnace.

With regard to the concentration process of poor ore, it has proved an established success with copper ore, although, with iron ore, the same process still belongs to an experimental stage.

However, the latest showings given by the Schwartz Experimental Works situated near Duluth, Minnesota, U. S. A., are really noteworthy.

Notes:—The Schwartz Experimental Works is located at the west of Duluth on the northwest of Lake Superior, U. S. A. It was established by M. Schwartz in 1916, being completely equipped by the investment of G.$2,000,000. Poor ore containing 30% is used as material, a refined ore of 65% being turned out. The refined ore is quoted on the market at G.$7 per ton, as against G.$4 per ton of natural rich ore put out at Mesaba, Minn., U. S. A., which is credited with 53% of iron.

Since the artificial conversion of natural poor ore into rich ore has competed favourably with the natural rich ore produced from the Mesaba belt, it is said that a proposition is on the tapis to found an extensive ore-concentration plant having a capacity for 4,000 tons per day between Mr. Jackson, who has successfully operated copper mines in Utah, U. S. A., Mr. Rockefeller, and a few other capitalists.

If a similar experiment could be transferred to Anshan with equal success, and a refined ore containing 60% or so could be obtained from the poor ore of from 30 to 40% at the producing cost of ¥13 or less, the enormous magnitude of the benefit accruing from such successful experiment may be considered as equal to the acquisition of over 180,000,000 tons of a natural rich ore containing more than 60% of iron, of which the mining cost is not more than ¥11 per ton.

As a like experiment, in the event of its successful consummation as indicated above, may be extended to the mines in the rest of Manchuria, Chosen, and Japan proper, the effect of any such success may well be called very farreaching and important.

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Notes:—The advantage of the artificial rich ore, which requires less coke for smelting than natural rich ore, becomes larger as the price of coke rises. Supposing that the production cost of coke should go down to ¥20 at some future date, ¥47.93 per ton would suffice for putting out pig iron, provided an artificial rich ore of 60% be used. For the sake of comparison, it may be mentioned that, if a natural ore of 60% should be used for a like purpose at the same amount of producing cost, several disadvantages would follow in the shape of the increase of consumption of coke and limestone, the decrease of the producing capacity of the smelting furnace, the increase of the quantity of slag, etc., and the highest admissible quotation on the ore would be ¥10.34 per ton.

Then, in the aggregate quantity of the ore, two or three tons of 30% poor ore will suffice to put out 1 ton of 60% rich ore, 400,000,000 tons of poor ore may be appraised as equal to

The cost of production per ton varies. It is as under when ball ore is used:—

	Quantity ton	Price per ton	Actual cost
Coke	0.9	¥ 20	¥ 18.00
Ball ore	1.56	13	20.28
Limestone	0.55	3	1.65
Other expenses	—	—	8.00
		Total	¥ 47.93

When natural rich ore is used, the production cost per ton is as follows:—

	Quantity ton	Price per ton	Actual cost
Coke	1.00	¥ 20.00	¥ 20.00
Ball ore	1.56	10.34	16.13
Limestone	0.60	3.00	1.80
Other expenses	—	—	10.00
		Total	47.93

The present is still at an experimental stage, and it is still uncertain whether the experiment will succeed or not. However, seen from a purely technical point of view, there is no special difficulty considered as too great to be surmounted in any phase of the experimental process. The only question awaiting solution lies in the cost of production, that is to say, whether or not the cost of refining poor ore can be reduced to below the level at which natural rich ore can be competed with successfully. There seems to be not a shadow of doubt as to the affirmative nature of the answer to this question.

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Notes:—Granting the production cost of refined ore to be ¥13 per ton, every item will be amply met as indicated in the following table:—

Calculating poor ore at ¥1.50 per ton and allowing 2.50 tons of poor ore to be sufficient for putting out 1 ton of refined ore containing 60% of iron,

a.	For turning out 1 ton of refined ore	¥3.75
b.	Ore-concentration cost	5.50
c.	Cost of putting out ball ore	37.5
	Total	13.00

For the reasons given above, the study of how to dispose of poor ore constitutes the one important question confronting the Anzan Iron & Steel Works. However, it is not only a problem of the Anzan Works, but, in the opinion of the author, is one of national significance to Japan.

WOOL QUESTION AND MANCHURIA & MONGORIA.

By Mr. J. Tochinai.

As materials for clothing in Japan, both cotton and wool, which are in the most extensive demand, have to be imported from abroad almost exclusively, excepting silk and hemp. From the present indications, it seems quite hopeless rather than extremely difficult to produce both cotton and wool in Japan sufficiently to fill the domestic needs. Especially, wool and woolen goods are not only necessaries essential to our daily life, but constitute the most important raw materials for military and naval clothing indispensable to the national armament. Their supply conditions have a direct bearing upon Japan's strategic welfare.

The following table quoted from the Annual Foreign Trade Report published by the Finance Office, Tokyo, gives the actual import amounts of woollen materials between 1917 and 1919, and will show incidentally how Japan stood in the matter of wool and woollen goods:—

	TOP		WOOL		TOTAL	
	Piculs	Value, the unit being ¥1,000	Piculs	Value, the unit being ¥1,000	Piculs	Value, the unit being ¥1,000
1917	43,253	12,326	353,031	39,785	396,284	52,111
1918	25,483	11,004	362,648	49,141	388,131	60,145
1919	32,398	13,736	385,326	47,567	417,724	61,303

Remarks:—Most of the top was imported from Australia, and in a small quantity from Cape Colony, Natal, Australia, China, Argentina, Great Britain, the

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United States, Russia etc., in the order mentioned as regards the volumes of imports. The imports from Cape Colony and Natal took up the major portion.

As shown in the above table, both top and wool combined, composing woollen materials, which were imported into Japan during the recent three years,

TOSSING KAOLIANG INTO THE AIR TO SEPARATE GRAIN FROM CHAFF.

ran up to between about ¥40,000,000 and ¥60,000,000 annually. It was due to the development of woollen industry at home (in Japan). It may be mentioned that up to about 1913, the import of woollen manufactures had been comparatively heavy, whilst the raw materials imported had reached no more than some one half or even one-third of the present amounts. From 1914-1915 after the outbreak of the great world war, orders were received by Japan for military and naval supplies from Russia, the United States, China, etc., and this caused a remarkable increase in outputs, and at the same time, a national tendency was created, from the general desire to secure the independence of munitions or military and naval stores and also from other considerations, towards raising the national production gradually.

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To make the supply of the necessary raw materials dependable is needless to say, necessary in seeking the independence and development of the national industry in question. Moreover, since the issue of the Wool Control Act by the Australian Commonwealth in 1916, a serious menace has threatened the woollen industries of Japan. Japan was made to feel very keenly the effect on her industrial and strategic well-being of changes of other countries' policies regarding the export of such raw materials as are absolutely necessary to her own existence.

The problem of wool supply has come to have a very serious significance to Japan, not at all to be made light of.

On this account, the Japanese Government has drafted the plan of supplying Japan's own wants with regard to wool from 1917-1918. In order to realize the independence of the woollen industries in the future, sheep farms were founded at different places; the Law for encouraging the raising of merino-sheep was promulgated, and breeding sheep, which were imported from abroad, were distributed to private parties to help the propagation of sheep. As a result, Japan's stock of merino-sheep has reached 10,000 head.

It should be noted that the encouragement of sheep-raising dates back to the early years of the Meiji Era, in which the Government, alive to the necessity to raise wool at home, imported merino-sheep from Europe, the United States, China, etc.; Government sheep farms were opened; and sheep-raising was encouraged. In consequence, the sheep were counted by thousands, but a relapse soon followed, and the worthy enterprise fizzled up in time. This failure was owing mainly to want of knowledge concerning the domestic animals and also to the wrong feeding and mismanagement of the sheep-raising industry.

Moreover, the people lacked an adequate grasp of how absolutely requisite wool is, and in addition, how to scour and weave wool was then but slightly known. In the author's opinion, there are other valid reasons, besides those already enumerated, to account for the above failure.

Firstly, Japan herself is of narrow proportions, and most of her open area is appropriated for rice-farming. For the feeding of the water-sources and for other reasons, afforestation has become an important factor in the utility of the open area, leaving but little space for pasturage.

Secondly, the farming classes are adopting the intensive agricultural system in its extreme form, and are managing to make both ends meet barely by carrying

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on sundry bye-industries, and have no time or labour left available for sheep-raising.

Thirdly, the Japanese people, unlike the inhabitants in Europe and America, did not start their racial career as nomads depending for sustenance upon their cattle, and on this account, cattle-raising interests them little.

Fourthly, the climate, soil, and other considerations in Japan reduce the need of wool and meat to a much lower plane than in other countries. This has impressed upon the Japanese but nominally the necessity to raise domestic animals, excepting the draft animals like horses and cattle.

Over and above, for the solution of the ubiquitous food problem, the reclamation of the waste land is to be pushed forward with redoubled energy. Then, from the strategic and other necessities, both horse-and cattle-raising has to be extended. Next, the forests must be replenished, and auxiliary afforestation be undertaken so as to augment the supply of timber and fuel wood.

The above mentioned claims on the utilization of the open area in Japan are too exacting to leave space enough for increasing the number of the sheep stock of Japan above 1,000,000 head, which plan, by the way, is admittedly a necessary undertaking, but, for the reasons already given, is exceedingly difficult of realization. It is very likely that, after several stages of modification, the plan will be executed only in part.

Talking of the world's situation concerning wool production, the aggregate annual amount of wool is estimated at between 2,700,000,000 and 3,000,000,000 *kin*, the larger portion of which is put out in Great Britain inclusive of Australia, New Zealand, etc., followed by South America, North America, Russia, China, etc. The demands for wool have remarkably increased in all countries especially after the Great War, and this phenomenal increase appears to be bound to be sustained for some time to come.

On the other hand, in the countries above mentioned, the wool outputs are threatened with a gradual decrease, according as the reclamation work progresses and the need for domestic animals for the sake of their meat increases. The shortage of supply of wool is certain to be crystalized into one of the burning issues of world-wide interest.

It behoves the Japanese people to guard themselves against the possible wool-famine, and to establish some permanent plan to meet such contingency, both practicable and expedient.

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Concerning the merino-sheep of China, most closely related to Japan, nothing has yet been done at all, unlike in any country in the West, for either the improvement of the breed or the propagation of the stock. Sheep-raising is still toddling in its infancy. Any approximately exact number of the sheep in all China is unavailable. But, the export of sheep from all China in recent years was 33,000,000 *kin* as the mean figure for five consecutive years. The domestic consumption and the amount of sheep skins being taken into reckoning, the total wool outputs may be put in the neighbourhood of about 43,000,000 *kin*. Calculating the per head average output of wool at 2 *kin* per annum, the total number of sheep may be inferred to be about 21,500,000 heads, which may be accepted as an approximately accurate figure.

The chief merino-sheep centre in China is North China, most prominently Chinghai, Kansu Province, Mongolia, etc. Next come Shenhsi, Shanhsi, Chihli, Shantung, and Honan Provinces. The sheep stock of Manchuria and the eastern part of Inner Mongolia is estimated at from 2,200,000 to 2,500,000 head, being more than 10% of the entire stock of China. Nature has endowed these regions bounteously for stock-farming, and they abound in likely sites for excellent pasturage.

Therefore, there is plenty of room for the improvement of the breeds and the propagation of the stock. In a sense, these districts may well be styled as a promising stock farming zone. It is because of this that we raise a cry for the improvement of the sheep stock in Manchuria and Mongolia as the first step towards the betterment of the sheep breeds of China. Thus, why the South Manchuria Railway Company began to pay serious attention to the improvement of the sheep breed in 1913 and has been pushing forward steadily its original plan year after year may be satisfactorily explained.

According to the results of the experiments conducted by the South Manchuria Railway Company for the improvement of the merino-sheep breed, with regard to the showing given by the cross-breed between the merino-sheep of superior grade imported from abroad and the native Mongolian breed, 4 *kin* of wool per annum on an average is obtainable from the half-blood, as against about 2 *kin* per head on an average, the output increasing to 5.6 *kin* on an average in the case of the quarter-blood and giving a finer fibre, too, which latter quality enhances the value. The sheep above the quarter blood are found suitable for the so-called fixed breed available for improving the native breeds of Mongolia.

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It was proposed to found sheep breeding farms at the most likely sites in Manchuria and Mongolia, in order to propagate the improved breeds, so that, in twenty years' time, over 2,000,000 head of native sheep in Manchuria and Mongolia may be improved completely and the present total yield of wool to the amount of only between 4,000,000 and 5,000,000 *kin* may be doubled or even trebled at a bound, up to the handsome aggregate of 13,000,000 and 14,000,000 *kin* per annum.

This gigantic plan is now under execution.

Our cry for the improvement of wool, together with the improvement of Beans (Soya Bean) and the extension of rice farming, has originated from our earnest desire to obviate the necessity to rely upon imports from the distant West for the filling of the national needs gauged at nearly 40,000,000 *kin* per annum, and to supply the wants with the outputs obtained from Manchuria, Mongolia, China, and the adjoining countries.

We cherish the keenest hope of a more extensive scope that, regarding the raw materials necessary to the daily life of the Orientals and also to staple industries, inclusive of wool, rice and other cereals, cotton, coal, iron, timber, etc., some workable plan on a permanent basis for the supply of all demands in the Orient with the indigenous outputs and manufactures, will be devised.

From this broader point of view, it will be necessary to arrive at a perfect understanding and cooperation between the States and the peoples in all the Orient. It will be a stupendous task attended with divers difficulties and taxing the finest intellect and best effort of ours.

In short, agriculture, in my opinion, constitutes the foundation of the industrial Manchuria and Mongolia, and all lines of trade and industry must spring from the agriculture.

Consequently, the improvement and development of the agriculture, as I believe it, promote the welfare of all the inhabitants in Manchuria and Mongolia and, at the same time, contribute to the opening up of the natural resources of Manchuria and Mongolia.

Investment in Land.

To purchase land to carry on agricultural pursuits in Manchuria and Mongolia, it will be most expedient to rent the land to Chinese tenants. The prices of land

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vary, but along the South Manchuria Railway Lines, the ordinary quotations on farm land range from ¥30 to ¥50, having the average of some ¥40. As to the land rent, there are two ways of paying in money and in kind, at the rate of from ¥2 to ¥4 per 300 *tsubo*, or ¥3 on an average. The burden upon the land itself is comparatively light, the land tax being only 15 sen per 300 *tsubo*. Other assessments such as the local tax, village rate, etc., have to be borne by the tenants. In ordinary cases, when farm land is bought for tenancy and ordinary crops are raised on the land, the land rent equivalent to some 7% of the purchase money per annum is accepted as a reasonable amount.

In Manchuria and Mongolia, land may be mortgaged as elsewhere. The mortgagor may have borrowed a sum of money on the temporary surrender of land in his or her possession to the mortgagee, on the express understanding that, upon the repayment of both principal and interest, the land in question shall be restored to the original owner. As to the term of mortgage, it may be ten years or less, or else for an indefinite period. In ordinary cases, 70% of the current value of the land is advanced by the mortgagee, who may thus realize about 10% per annum on his or her investment.

But, in the district more or less remote from the existing railways and also in the part of Kirin Province where a railway is to be built in no distant future, or in that portion of Mongolia in which the Ssupingkai-Chengchiatun Railway is to be extended shortly, the price of ordinary farm land is from ¥5 to ¥15 per 300 *tsubo*, and the land rent is payable according to the customary share profit usage, the landowner taking 40% of the crop which amounts to some 1 *koku* of kaoliang per 300 *tsubo*. On this basis, the profit to be realized on the land by the owner is from 15 to 20%, and the purchase money may be completely recovered in less than ten years on an average.

Especially, these districts have been opened up comparatively recently, and contain much space more fertile than along the existing railways. With the construction of railway in the immediate prospect, the land price in these parts is ascending remarkably, and once the railway in project is completed in a few years' time, the land value is bound to become trebled or to increase even fivefold.

Furthermore, about 3,000,000,000 *tsubo* of land in Manchuria and Mongolia is inferred to be suited for rice-farming. Supposing one can procure tracts of land possessed of irrigable facility not far from the railway, say, at from ¥25 to ¥40

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per 300 *tsubo*, the conversion of the land into paddy field for rice farming may be effected at the cost of less than ¥20 per 300 *tsubo*.

The profit accruing in such cases is larger. Calculating the per 300 *tsubo* output at 3 *koku* of unhulled rice, and supposing that half the yield goes over to the owner, the owners' profit may be placed at 7 to 8% per annum from the start, with a hope that the rate will be raised up to over 12% and even 15% per annum.

By improving the method of cultivation and manuring, the outputs may be increased, and when the rise of the land value is taken into reckoning, a still higher percentage of profit may be expected.

Next the cultivation of tobacco of American and Japanese breeds about Fenghuangcheng on the Mukden-Antung Line and also along the Main Line is another promising industry.

Then, in the country south of Liaoyang, which is pronounced to be excellently adapted to fruit-raising, orchards may be laid out afresh on tracts of land of, say, from 15,000 to 24,000 *tsubo* each to be bought for the purpose. Such investments may be lucrative and at the same time may cater to the horticultural inclination.

To cite a practical instance, on an orchard of 12,000 *tsubo* at Port Arthur, in which apples, pears, grapes, peaches, etc., were raised, a net profit of about ¥90 per 300 *tsubo* has been cleared after 7 or 8 years from the planting of the trees and vines.

How to Buy Land.

In Manchuria and Mongolia, the permanent lease of not only privately owned land, but also of the Government land and such as belongs to Mongolian princes may be freely sold and purchased. No such transactions had been officially permitted to foreigners before, but by virtue of the Sino-Japanese Treaty signed in 1915, a lease of not more than thirty years is made possible, subject to an unconditional renewal, in Manchuria, whilst, in Mongolia, the Japanese are entitled to start enterprises conjointly with the Chinese, and on this account, the purchase and sale of land are practically permissible.

Food Question and Manchuria and Mongolia.

The relation of the production of rice and other cereals, which make up the staple food stuffs of the Japanese people, to their demand in the Empire has been

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becoming more ill-balanced year after year, and a tendency is growing more pronounced towards the aggravation of the shortage. As a result of the great War, all the countries in the world seem to have become profoundly impressed with the necessity to supply their own wants not only in the matter of all kinds of industrial raw materials, but also more emphatically food-stuffs. This problem has been given greater prominence in Japan which has been suffering from overpopulation. Attempts have been made to regulate the prices of rice in order to prevent both undue rise and fall. Some economists are out for the economizing of consumption and others recommend the use of suitable substitutes for rice; then the Government has issued, with the support of the Imperial Diet, the Laws for encouragement of reclamation with a view to increasing the cereal crops.

To give the actual figures of supply and demand in Japan, her population in 1918 was 56,850,000 consuming 61,880,000 *koku* of rice, giving the per capita average of 1.088 *koku* per annum. The rice outputs of the preceding year (1917) totalling 54,560,000 *koku*, the deficit amounted to 7,320,000 *koku*, which was supplied with imports from Formosa, Chosen, China, etc.

The statistics shows that up to about 1887, the rice harvests of Japan used to leave more or less surplus supply. Then the balance began to be turned, and the supply fell short of meeting the demand. In 1897, the shortage reached about 2,000,000 *koku* and in the succeeding year (1898), as high as 4,300,000 *koku*. In 1902, in which the rice crop turned out a signal failure, and also in 1904 and 1905, during which the Russo-Japanese War took place, the shortage ran up to between 5,000,000 and 6,000,000 *koku*. In recent years, the deficit of an ordinary year ranged from 2,000,000 to 2,500,000 *koku* on an average, valued at between ¥30,000,000 and ¥40,000,000.

The wheat supply has also failed to satisfy the demand. 700,000 to 800,000 *koku* of wheat worth roughly ¥10,000,000 has had to be imported annually.

The above was of course due to the increase of the population, which, in the course of one year in 1918, was measured at about 780,000.

At such a pace of increase, thirty years hence, the population will become 85,000,000, fifty years hence 113,000,000, and one hundred years hence 228,000,000.

Reckoning the per capita annual allotment to be 1 *koku* of rice, 85,000,000 *koku* will be requisite thirty years hence, 113,000,000 *koku* fifty years hence, and 228,000,000 *koku* one hundred years hence.

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For my own part, I hold it as ill-advised to depend for the staple-foodstuff of the Japanese people upon rice, taking into consideration the possibilities of the Japanese race in territory other than rice-producing countries, quite apart from the mere relation between supply and demand, and I heartily recommend a mixed diet with cereals other than rice such as wheat made into bread, for instance.

The Government authorities are planning to reclaim 3,900,000,000 *tsubo* of land what by the improvement and extension of land under cultivation and what by the improvement of the agricultural methods in the course of thirty years, in addition to raising the per 300 *tsubo* crop from 1.7 *koku* to 2.5 *koku*. This plan is estimated to increase the national rice crop by about 33,000,000 *koku*, which is hoped to fill the rapidly rising needs. Such a course is indeed most opportune, and it is to be devoutly hoped that the Government plan as above mentioned will be carried out successfully. The question is whether or not there is left room sufficient for the realization of the plan. Moreover, the per capita annual allotment of rice is tending to increase, according to the stern statistics. In time, the per capita average may go up to 1.2 or 1.3 *koku*, aggravating still further the annual shortage amount.

Let the area for cultivation be enlarged as it may, coupled with the improvement of the agricultural methods, towards the common end of increasing the rice outputs, the last limit of a well-balanced supply and demand in all Japan inclusive of her colonies, will be reached earlier than predicted by the more optimistic economists, and what deficit may result will have to be met with imports from abroad. Such a contingency is really inevitable. Every Japanese with his country's best interests at heart ought to do his share in the great national task of facing the inevitable squarely and solving the puzzling problem of food-stuffs.

Manchuria and Mongolia are considered as capable of putting out more than 10,000,000 *koku* in due course of time. Already the production of Beans, barley, wheat, kaoliang, millet, maize, etc., is, in a sense, unlimited, whilst, regarding cattle, pigs, and sheep, there is a passable output, with something to spare in a few cases.

It is to be sincerely hoped that some adequate steps will be taken under careful consideration as regards the propagation and utilization of the live stock, in order to help readjusting the supply to the demand directly or indirectly in Japan, more particularly in Chosen and the Kwantung Leased Territory.

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Manchuria and Mongolia as Agricultural Colony.

Manchuria and Mongolia are, as they are, a great agricultural country having tremendous possibilities in store for them. As a means of accelerating the improvement and development of the agriculture, it is believed to be the wisest and most opportune course, judging by the existing conditions in Japan and China to settle in these districts Japanese farmers who are better experienced and equipped than the Chinese natives.

As regards the chances of success held out for Japanese farmers in quest of their fortune by settling in Manchuria and Mongolia, the question has been discussed from time to time among the parties interested in Japan. For, once the question be answered favourably by actualities, it will largely help opening up the natural resources and at the same time contribute substantially towards solving the food-problem in Japan.

On my arrival in South Manchuria in 1913, I recommended the selection of time expired soldiers, after serving a time in the Japanese Railway Guard, who have had experience in farming in Japan, are sound in both mind and body, and have the means to pay their own expenses at least for one year, for the purpose of residence in the South Manchuria Railway Area to follow the agricultural avocation.

The above recommendation has been acted upon year after year, and in the course of four years from 1914 to 1916, thirty four households were settled in the Railway Area. Each household had from 36,000 to 60,000 *tsubo* of land under cultivation leased by the Railway Company, the total area thus rented amounting to 1,898,500 *tsubo*. The land rent ranges from 4 *rin* (10 *rin* make 1 sen; 100 sen make ¥1) to 6.5 *rin* per *tsubo*, and in some cases nothing is charged. The per *tsubo* rent is 2 *rin*, making the per tsubo annual rent 60 sen, a most moderate rate. In addition, a sum of money not more than ¥300 is available for loan to each tenant for building farm house, purchase of draught animal and agricultural implements, etc., at the interest rate of 8% per annum, redeemable completely by the tenth year in annual installments after the third year. Concerning the management and selection of agricultural crops to be raised, experts of the Railway Company are ready to offer useful hints.

At the time the above plan was put in execution, the Railway Company calculated the annual disbursements for each settler to be ¥1,019, including the

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current expenses, redemption of the fixed capital, and the interest, whilst the earnings, making allowances for the possible failure of crops, were estimated at ¥1,416, leaving the net profit of ¥397 for the sustenance of the household etc.

The actual data obtained from among the settlers from 1914 to 1918, numbering 28 to 34 households, that were considered as tolerably fair in their vocational showings and also as reliable, are as under:—

Receipts and Expense Accounts Per Household Renting 60,000 *tsubo* of land.

	Total expenses	Total receipts	Net earnings	No. of households
1914	¥1,025.42	¥1,526.13	¥500.91	5
1915	904.74	1,079.24	138.50	12
1916	1,143.68	1,293.59	149.91	16
1917	1,546.48	1,965.09	418.61	10
1918	1,653.58	2,243.05	589.47	22

The above table will indicate that, excepting 1915 and 1916, the returns for which were anything but encouraging, the other years fulfilled the sanguine expectations of the Railway Company, or in a few cases, even exceeded them. The crop conditions may have been one of the factors of these varying returns, but it may be pointed out that, in 1915 and 1916, silver suffered a very bad fall, and, as the prices of produce were quoted in gold, the receipts were so much the lower. On the contrary, silver rose in 1917 and 1918, and besides, the riper experience acquired by the settlers in their agricultural pursuits may be taken into reckoning.

From the above returns, agricultural pursuits of middle class as followed by Japanese in South Manchuria, promise suitable profit.

It may be pointed out here that the land rent of 60 sen per 300 *tsubo*, as charged by the Railway Company, is exceedingly moderate, and may be accepted as a sort of special rate allowed at the experimental stage of the enterprise.

In fact, the ordinary rent along the South Manchuria Railway ranges between ¥2 to ¥4 per 300 *tsubo*, the average being about ¥3.

If the above average rent were to be imposed on the ex-soldier settlers, the total annual rent for the per capita share of 60,000 *tsubo* would be ¥600, as against the present rent amount of ¥120 per annum, adding so much to the burden of each settler. With such a heavy rent to pay to the Railway Company,

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the loss in 1915 and 1916 would have been quite unbearable, and even in the other years, the net profit would have been nominal, indeed too meagre to support the household, not to mention any savings for the improvement or extension of the enterprise.

This amply proves that the following of an agricultural avocation in the Railway Area, paying the ordinary land rent, does not pay.

The majority of the ex-soldier settlers expressed their hope at the outset that, since the land area of 60,000 *tsubo* is not sufficient to make both ends meet, the area for lease might be enlarged.

On closer enquiry, it has been found that the above land area is not necessarily too small, but that, like many new settlers in a raw colony, some of the agriculturist settlers above mentioned dreamed of getting rich by the shortest and easiest cut and preferred playing with their luck rather than chiseling their fortune with all their might and main. It was found also that some of them sublet part of their leased land to Chinese, wishing to clear the difference in the land rents. They exercised scanty judgment in the selection of agricultural crops they intended to raise, and also in the method of cultivation. They would sell their produce in lowly quoted silver, whilst buying daily necessaries in dearly-quoted gold. Then, the idea of any bye-industry such as the raising of pigs, poultry, etc., or any thrifty expediency such as cartage of produce over the frozen country in winter on more moderate terms, which are popular practices with the Chinese farmers, never occurred to many of them. It is possible that some of these settlers, because of the want of title to the land, did not go about their business as whole heartedly as they might otherwise have.

On the other hand, the Chinese farmers cultivate a smaller area of land than the Japanese ex-soldier settlers; still they ply their trade with a steady aim worthy of a Puritan pioneer; and they find enough not only to sustain the family, but also to lay by something against a rainy day.

The lower standard of living, their acclimatization, and their proverbial thrift and industry go to make all the difference in the world.

It would be too much to expect of the Japanese settlers to put up with the same low level of living as their Chinese neighbours.

The results of settling Japanese farmers in the Railway Area are as mentioned above.

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While it is still too hasty to pass a conclusive remark either way on the success or failure of the enterprise indicated above, the peculiar political, social, and economic conditions now prevailing would seem to hint at the wisdom of reserving a definite opinion on the subject until after a more thorough study thereof has been made.

After all has been said, the agricultural exploitation of Manchuria and Mongolia depends in a sense upon the importation of talent and capital. In other words, an adequate area of land should be either bought or leased; the natives may be guided or utilized in prosecuting the agricultural industry; science may be turned to practical account in the selection of crops of industrial value, etc., the improvement and propagation of live stock, and the afforestation of waste land available.

CURRENT NEWS.

INFECTIOUS CASES IN S. M. RAILWAY AREA.

At End of January, 1921.

At the end of last January (1921), according to the returns of the South Manchuria Railway Company's Sanitary Office, there were the cases of infectious diseases at the different Railway Hospitals along the South Manchuria Railway Lines as follow:—

Wafangtien	3	Ssupingkai	2
Tashihchiao	2	Kungchuling	2
Anshan	2	Changchun	1
Liaoyang	5	Antung	6
Mukden	22	Fushun	22
Tiehling	4		
Kaiyuan	24	Total	80

The above list included six cases of dysentery, fifty-one cases of typhoid fever, four cases of para typhus, three cases of small pox, 3 cases of eruptive typhus, one case of diphtheria, eleven cases of scarlet-fever, and one case of cerebro-spinal meningitis of infectious nature.

The total cases of infectious cases from April, 1920, to January, 1921, were 1,483 Japanese and 215 Chinese, inclusive of 221 Japanese deaths and 43 Chinese deaths.

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It may be allowed that there were a good number of infectious cases concealed from the notice of the authorities concerned.

S. M. R. TRAFFIC RETURNS.

For Last Decade of January, 1921.

The South Manchuria Railway traffic returns for the last decade of January, 1921, show a gradual increase of produce carried southward from the interior stations by the railway. The increase was more remarkable with Beans and kaoliang. Wheat and wheat flour transported southward from the Chinese Eastern Railway, which decreased in quantity for a time, revived. The total goods carried during the same decade amounted to 361,261 tons, being an increase by 34,743 tons on the figures for the corresponding decade of the previous year. The goods receipts totalled ¥2,585,406, showing an increase by 32% over the same period of the preceding year.

The principal goods with their tonnages were as under:—

	Tons.		Tons.
Beans...	85,098	Ore	3,413
Wheat	23,071	Firewood & Charcoal... ...	3,246
Kaoliang	19,922	Rice	1,482
Salt	14,776	Fruits	1,263
Bean Cake	13,527	Cotton fabrics	1,122
Coal	8,763	Hard ware	754
Wheat flour	8,191	Vegetables	670
Cereals	7,538	Sugar	596
Millet	7,304	Stone, ballast, etc.	369
Maize...	7,283	Cement & lime	273
Timber	5,781	Fish, salt & dried	166

PAYMENT OF FREIGHT MONIES AND OTHER CHARGES.

On South Manchuria Railway Lines.

The South Manchuria Railway Company has decided to introduce from April 1st, next a new system of payment of the freight monies and other charges for the through goods and *kin* rate goods only on application by the owners of the goods. All articles considered as liable to decay, damage, or decrease in weight, which may detract from the value of the goods, will be excepted.

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By the new arrangement, the owners will be at liberty to pay the freights and charges on arrival of the goods at the destination, provided the same freights and charges do not exceed in amount half the market value of the goods at the place of despatch.

Consequently, the necessary revisions are to be made upon the existing procedures concerning the payment of freights and other charges for through goods for transportation over the South Manchuria Railway Lines and the Imperial Government Railways of Japan, and also concerning the payment in advance of the packing expenses, etc., which latter facility is to be abolished from April, 1st.

BONDED WAREHOUSE AT FENGTIEN.

Since the arrival of the new Customs Commissioner at Fengtien (Mukden), the proposed founding of a bonded warehouse at Fengtien has been pushed forward with vigour. We understand that an understanding regarding the proposition is now in the course of establishment with the Customs authorities at Dairen, Antung, and Yingkou.

A site for the new Custom House, Fengtien, has been fixed at the vacant ground adjoining and at the east of the Russian Consulate-General, and construction work on the Custom House and the new warehouse is to be taken up this year.

Mr. Kuan-haiching (Inspector of the Customs), who has now his temporary office in the Foreign Intercourse Office, Fengtien, will remove into the new Custom Office on its prospective completion.

TRAFFIC ON WESTERN SECTION OF CHINESE EASTERN RAILWAY.

As reported previously, the passenger service on the Western Section of the Chinese Eastern Railway from Harbin to Manchouli was suspended as a preventive against the spread of the penumonic plague.

However, in order to serve the convenience of the produce dealers and also the railway employees, a once daily run from each end has been resumed between Harbin and Anta on the following schedule:—

Train No. 33 : Leave Harbin 3.30 p.m.
Arr. Anta 7.20 a.m.
Train No. 32 : Leave Anta 4.40 p.m.
Arr. Harbin 8.25 a.m. next day.

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Between Anta and Manchouli, trains are run three times a week, once on Tuesday, Wednesday, and Friday from each end.

2nd class passengers are permitted to entrain to the extent of 15 passengers, providee they have medical certificates of health.

NEW GAS HOLDER AT SHAHOKOU.

The construction of the new gas holder of the South Manchuria Railway Company's Gas Works at Shahokou, having a capacity for 150,000 cub. ft., is to be completed by about the middle of March, 1921.

"SAFETY CARS" FOR LOCAL TRAMWAY.

In the United States, what is styled "safety cars" has come into popular use on the tramways of the principal cities.

The South Manchuria Railway Company's Electricity Works is planning to construct about ten such cars and have sent out enquiries thereanent to the United States.

The construction cost is put at some ¥30,000 per car, and it is throught better to import nearly all the necessary materials from the United States.

The safety car is equipped with finer mechanical installations than the ordinary cars. It permits of operation and stop with greater case.

NEW WAY OF DISPOSING OF LOCAL FILTH.

The refuse matter given by the population of the city of Dairen exceeds 900 *koku* per day. 700 *koku* of the filth is removed by carts under the supervision of the Hygienic Section of the Dairen Municipality to the Filth Depot below the Fushimidai Electric Park, whence to be transported by hand cars over the rail tracks in part to the filth reservoir at Peikangtzu (on the north of Hsiaokangtzu, the Chinese Quarter). It is given by the major part of the city east of Fushimidai. For this purpose, forty hand cars, each bearing a receptacle with a capacity for about 2.5 *koku*, are making six trips a day. The remaining 200 *koku* is yielded by that part of the city comprising Fushimidai and Hsiaokangtzu and is carted by nine wagons, each bearing about 3 *koku*, making seven trips a day on an

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average. The filth is emptied into the old reservoir at Peikangtzu on the premises of the fertilizer factory owned by the Shiki-gumi of Dairen.

The filth used to be distributed by sale to the farmers at Chinchou, Ryojun (Port Arthur), etc., but this year, it has proved a drug in the market.

Mr. S. Shiki, of the Shiki-gumi, hit upon the plan of manufacturing fertilizer having a commercial value from the filth and carried on a series of experiments for the conversion of the filth into chemical manure.

Last April, Mr. Shiki leased a tract of land comprising about 7,000 *tsubo* on the shore of Peikangtzu and started building a factory on the site. Work was finished on February 10th. It consists of a reservoir, a large kettle for stirring up with chemicals, a large boiling kettle, and a drying apparatus. The reservoir can hold about 10,000 *koku*, about as much as the Dairen inhabitants can give in twelve days. The contents of the reservoir are sent first to the former kettle to be stirred up therein with sulphuric acid and other chemicals. By this means, the manure part undergoes a chemical composition and is separated completely from the water. This is in turn sent into the boiling kettle, in which the manure part is precipitated to the bottom, whilst the water is let out of the kettle and discharged into the sea. During the chemical process, all noxious bacteria are killed. The manure part left is then boiled before being sent into the drying room to become an excellent manure containing in suitable quantities nitrogen and potassium chlorate, surpassing even Bean Cake in fertilizing property, as demonstrated by practical tests.

Merits of New Fertilizer.

The method adopted at the new plant, completed only recently near the filth reservoir at Peikangtzu (close to Chinese Quarter, Dairen), is to make a chemical disposal of the filth and is thoroughly reconcilable to the exacting hygienic requirements. The chemicals used in the manufacturing process are possessed of sterilizing, anti-septic, and deodorizing properties, which all contribute highly to epidemic prevention. The product is pronounced as superior to Bean Cake in fertilizing virtue, and moveover permits of being offered to the consumers at very moderate rates.

Hitherto, the employment of the filth in its original form has been instrumental in spreading noxious microbes to the menace of public hygiene. Since the filth is boiled, all these harmful bacteria are completely killed. Moreover, the

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filth, applied in its original form, has its efficacy as manure reduced by nine-tenths which portion is wasted by evaporation. By means of the new manufacturing process, every bit of the fertilizing property is retained.

The new plant was opened to trial operation on the 13th inst.

By the return of spring, the few yards, which have not been favoured with fresh orders by the Imperial Navy, will be obliged to manage to pick up what odds and ends of repairing and job work there may be found.

Even such as are privileged to build to the order of the Navy will be forced to maintain themselves by seriously retrenching the excessive scale of the war times. Some builders have started already to dismiss part of their workmen. The Shipbuilding Department of the Mitsui Bussan Kaisha discharged over 400 hands reecently, and more dismissals are to follow. The Mitsubishi Yard has placed the supernumeraries on the suspended list entitled to 80% of their regular pays, to allow them time to seek an opening in the meantime. Requests have been made to the Naval Shipyards to take into their service as many men as they may need from among these supernumeraries.

Despite all these efforts to reduce the number of the unemployed, it seems bound to increase.

TRADE & INDUSTRY.

ORIENTAL DEVELOPMENT CO.

Activity of Fengtien Branch.

The Mukden Branch of the Oriental Development Co. has been trying to offer more than ordinary facilities to its clients since last winter. For instance, all new clients have been allowed the full measure of loan amounts consistent with the business sense. Secondly, the interest rate has been somewhat lowered. By the end of January, 1921, the total advances increased at a bound by over ¥2,500,000 to ¥18,790,000, which may be roughly itematized as under:—

¥8,270,000	invested in	city building and improvements
3,270,000	„	traffic and communications
2,170,000	„	land improvements and reclamation
830,000	„	agricultural activity
640,000	„	mining „
620,000	„	afforesting „
590,000	„	manufacturing industry

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Of the above total, the loans made to the Chinese clients amount to over ¥2,500,000. Owing to the recent sharp fall of Chinese small silver coins, the collection of the Company's credits due from its Chinese clients has become quite difficult, whilst applications for loans have remarkably increased. The Chinese, who proverbially have the main chance constantly in view, know well enough of the easy profit to be cleared by securing a loan when Chinese small silver coins are quoted low as at present, and repaying the same loan after they have advanced in market quotations.

The title deeds presented by the Chinese applicants for advances being often found anything but *bona fide*, the loans made so far have not reached a very large sum, but the Company is always prepared to extend as much facility as possible in case of the security being found sound.

BEAN MIXED STORAGE RETURNS.

At End of January, 1921.

The movement of new Beans has never been remarkable for briskness from the outset of the present season. The gradual fall of silver, coupled with the decline of the market, the steady decrease in demand, and the more threatening aspect of the economic circle in the interior, has all conspired to dampen the produce market.

The export of Bean Oil to the United States has also remained on the ebb, and may be called almost as good as suspended altogether.

Then, in Japan, with the sharp fall of rice price, the farming masses have become shorn seriously of their buying power. Moreover, there are left considerable stocks of staple produce at Kobe and Yokohama, tending to negative the export of Beans, Bean Oil, and Bean Cake.

Turning to the Chinese bean stock owners, they had been withholding the sale of their goods as late as circumstances permitted, seeing the disadvantage of disposing of them while both silver and Beans were quoted intolerably low. The approach of the old Chinese New Year, which is just preceded with the annual settlement day according to the time honoured usage, forced the owners to part with their holdings. This may be proved by the fact that the Bean storages along the Railway Lines from the end of January to early February roughly rose to 100,000

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tons from what they used to be in the neighbourhood of 30,000 tons from the end of November to December, 1920.

Business continues dull, whilst there is no bright hope-visible on the produce horizon.

MIXED STORAGE OF BEANS.

The statistics for Mixed Storage of Beans for January, 1921, immediately prior to the old Chinese New Year, was somewhat encouraging, the figures being about double those for the preceding December or November.

The total amount intrusted to the Company's Mixed Storage during January, 1921, was 722 carloads of Special kind, 4579 carloads of Ordinary kind, and 2,846 carloads of Inferior kind, making the total of 8,147 carloads.

Then, the goods taken out of the storage during January, including those received into custody in December and November, 1920, totalled 307 carloads of Special kind, 3,092 carloads of Ordinary kind, and 2,502 carloads of Inferior kind, aggregating 5,902 carloads.

Changchun Station took the first place on the list of the Mixed Storage Stations with 362 carloads of Special kind, 1591 carloads of Ordinary kind, and 2,069 carloads of Inferior kind.

The figures for Fanchiatun were 73 carloads of Special kind, 585 carloads of Ordinary kind, and 180 carloads of Inferior kind, totalling 838 carloads.

At Kungchuling, there were 609 carloads composed of 39 carloads of Special kind, 435 carloads of Ordinary kind, and 135 carloads of Inferior kind.

The statistics for the other Mixed Storage Stations were as under:—

	Special carloads	Ordinary carloads	Inferior carloads	Total
Kuochiatien	18	186	4	184
Ssupingkai	3	314	309	356
Shuangmiaotzu	1	18	6	25
Changtu	8	18	6	25
Kaiyuan	137	1,030	37	1,204
Tiehling	40	22	—	62
Hsintaitzu	23	11	—	34
Fushun	18	385	275	778
Yentai	1	—	1	2
Grand Total	721	4,579	2,846	8,147

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REMOVAL STATIONS.

The goods taken out of the Company's custody at the Removal Stations during the same month were as under:—

	Special carloads	Ordinary carloads	Inferior carloads	Total carloads
At Dairen Wharves ...	285	2,924	2,417	5,626
At Yingkou Station ...	19	135	71	226
At Pulantien Station...	3	33	14	50
Grand Total ...	307	3,092	2,503	5,902

TOTAL GOODS UNDER MIXED STORAGE.

At end of January, 1921.

The total bean stocks which lay under Mixed Storage at the end of January, 1921, were 655 carloads of Special kind, 2,270 carloads of Ordinary kind, and 1,379 carloads of Inferior kind, totalling 4,804 carloads.

PRICE LIST FOR JANUARY, 1921.

At Dairen.

According to the investigation of the local Civil Administration authorities, the retail prices at Dairen in January, 1921, showed only a slight variation from the figures for December, 1920. There was no material change in confectionery, tinned provisions, tea, coffee, beer, wine, whisky, brandy, aerated waters, tobacco, medicinal substances, dye-stuffs, dry goods, woollen cloths, kerosene oil, other oils, glass pane, and metals. Other merchandise indicated a general fall in price.

The January price list was as follows:—

Cereals:

Chemulpo rice (extra fine)	¥3.70	per 1/10 *koku*
„ „ (1st grade)	3.30	„
Chinnampo „ (extra fine)	3.60	„
Glutinous rice (Japanese)	4.50	„
Cracked barley	0.25	per 1/100 *koku*
Beans (Hokkaido)	0.39	„
„ (Manchurian)	0.20	„
Kaoliang	0.14	„
Millet	0.20	„
Red Beans (Hokkaido)	0.40	„
„ (Manchurian)	0.20	„

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Sugar:	
Rock candy	0.40 per *kin*
Soy	¥1.00 to 0.80 per 1/100 *koku*
Vinegar (Owari)	0.06 per 1/1000 *koku*
Pickled radishes	0.12 per 100 *momme*
Melon pickled in *sake* dregs	0.45 „
Meat:	
Tsingtao beef	¥0.55—¥0.25 per 100 *momme*
Pork	0.40 „
Chicken	0.90 „
Ham (Kamakura)	¥1.70 „
"Sake"	¥2.00—¥1.50 per 1/100 *koku*
Cotton cloth	¥7.50—¥7.60 per roll
Cotton	¥3.50 per *kuan* (8 1/3 lbs.)
Floss silk	¥7.00 per 100 *momme*
Coal:	
Fushun Coal	¥21.80 per ton
Penchihu	19.20 „
Cokes	32.10 „
Timber:	
Valu pine (in logs)	0.10 per cub. ft.
Kirin pine „	0.12 „
Cement:	
Onoda Cement	0.20 per 1/100 *koku*
Asano Cement	0.25 „
Brick:	
1st grade	¥2.00 per 100
2nd „	1.80 „

PRICES OF DAILY NECESSARIES.

In South Manchuria.

The continued economic dullness has pushed down the prices of daily necessaries by degrees.

The following table gives the retail prices of principal necessaries at several centres in South Manchuria, which, not being the strictly up-to-date figures, may be at a little variance with the actual prices, but may not be far from the truths :—

Rice :—

¥ 3.50 per 1/10 *koku*	at	Dairen
4.30	„	Ryojun (Port Arthur)
3.70	„	Chinchou
3.90	„	Fengtien (Mukden)
4.20	„	Changchun
3.30	„	Anshan
3.50	„	Antung

Beer ("Sapporo" brand) :—

60 sen per qt. bottle	at	Fengtien (Mukden) & Kaiyuan
45	„	Dairen and Ryojun
55	„	Liaoyang, Antung, & Penchihu
52	„	Fushun
50	„	Changchun

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Cotton :—

¥ 5.90	per *kuan* at	Ryojun (Port Arthur)
4.50	»	Dairen
4.20	»	Liaoyang
5.80	»	Fengtien (Mukden)
5.17	»	Changchun
6.00	»	Antung
6.50	»	Fushun

Sugar :—

34 sen	per *kin* at	Dairen
32	»	Ryojun (Port Arthur)
33	»	Chinchou
36	»	Pulantien
35	»	Liaoyang
38	»	Fengtien (Mukden)
35	»	Tiehling
38	»	Changchun
35	»	Tashihchiao
36	»	Kungchuling
30	»	Ssupingkai

Soy :—

85 sen	per *sho* at	Ryojun (Port Arthur)
¥ 1.05	»	Dairen
1.15	»	Pulantien
1.10	»	Yingkou
1.00	»	Liaoyang
1.20	»	Fengtien (Mukden)
1.10	»	Fushun
1.30	»	Anshan

Pork :—

45 sen	per 100 *momme* at	Dairen & Ryojun (Port Arthur)
23	»	Chinchou
20	»	Yingkou
25	»	Liaoyang
70	»	Fengtien (Mukden)
45	»	Changchun
30	»	Antung
30	»	Anshan

Charcoal :—

¥ 2.70	per bag of 6 *kuan* at	Ryojun
3.30	»	Dairen
2.30	»	Chinchou
2.80	»	Yingkou
2.10	»	Liaoyang
1.60	»	Tiehling
2.70	»	Anshan
1.50	»	Kaiyuan

Munro's Scotch Whisky :—

¥ 3.80	per qt. bottle at	Dairen & Ryojun
5.00	»	Fengtien (Mukden)
2.80	»	Changchun
5.00	»	Fushun & Anshan

Eggs :—

38 sen	per ten at	Ryojun (Port Arthur)
33	»	Dairen
35	»	Chinchou
33	»	Pulantien
26	»	Pitsuwo
28	»	Yingkou
30	»	Liaoyang
30	»	Fengtien (Mukden)
35	»	Tiehling
30	»	Changchun
43	»	Antung
30	»	Penchihu
30	»	Fushun
25	»	Tashihchiao
30	»	Wafangtien
30	»	Anshan
25	»	Kaiyuan
33	»	Kungchuling
25	»	Ssupingkai

Cigarettes ("Asahi" brand) :—

12 sen per package of 20 pieces at Dairen, Ryojun, Pulantien, Pitsuwo, Yingkou, Liaoyang, Mukden, Changchun, Antung, Penchihu, Tashihchiao, Wafangtien, Anshan, Kaiyuan, Kungchuling, & Ssupingkai

13 sen per package of 20 pieces at Fushun

11 » Chinchou

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SHIPPING NEWS.

SHIPBUILDING CIRCLE OF JAPAN.

Shipyards in a Bad Fix.

The position of the shipbuilders in Japan has gone from bad to worse. Since the latter half of last year, 1920, not a single building order has been received. Even as regards the job work, there has been very little to do in these times of the wretched depression of business. Nowadays, the building yards at home are keeping up a show of operation, what with the construction of the ships to order, and oftener, of stock boats and repairing of vessels mostly from the consideration of building materials on hand.

N. Y. K. STEAMER ON EUROPEAN SERVICE.

To Call at Dairen.

The Nippon Yusen Kaisha has decided to make the newly constructed steamer "Mito Maru" (of 7,000 ton class) call at the port of Dairen on March 13 as the first steamer on its European service to touch at Dairen. She is to load about 2,500 tons bunkers and a consignment of Bean Oil for Europe.

The steamer is installed with a special facility for the loading of oil. A vessel of a like pattern is to call here every month for the export of oil Europe way. Whilst the N. Y. K. Management has not yet finally decided to make this line a regular one, it is believed to assign steamers as an optionally regular route.

Hitherto the Nippon Yusen Kaisha has caused tramp steamers to call at Dairen.

The inauguration of the regular European and American services containing Dairen in the list of the ports of call with large-typed steamers since last year, has apparently induced the Nippon Yusen Kaisha to follow the examples.

At all events, the shipping company sent a councillor to Dairen recently to look over the ground. He stated in the following, substance:—

The N. Y. K. has been related to Manchuria only through its North China line and occasional tramp steamers. The steady development of this port has

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raised it to one of the few principal foreign trade gateways of the Orient, indeed even above the level of Kobe and Yokohama in a sense, and the Management is now convinced that something of a positive nature must be done to meet the requirements of the progressive times.

On my arrival at Dairen, I have been struck, for one thing, with the marvellous expansion of the port and particularly the growing activity of foreigners.

The fact that the Hongkong and Shanghai Banking Corporation has an office building of imposing dimensions in the course of construction near the centre of the city shows what an amount of interest foreigners in general are learning to take in things Manchurian. Then, large-typed foreign steamers are visiting this port in succession.

After a rough study of the local conditions, I feel inclined to recommend the call of the large-typed steamers on the two regular lines to Hamburg (Germany) and Liverpool, which are both once monthly.

As to the Company's American line, I intend to recommend the extension of the present Kobe-Seattle line to Dairen.

The Nippon Yusen Kaisha is distinctly disinclined to crowd itself into any field recognized in conscience as iucluded in the legitimate sphere of interest of another steamship company, but, needless to say, the Management is always ready to serve the convenience of its clients.

Talking of the Company's North China route, the vessels thereon fall short of the mark.

It may be added that the four liners on the Hamburg Line belong to 10,000 ton class and are each equipped with a facility for loading Bean Oil in bulk.

DAIREN SHIPPING RETURNS.

For January, 1921.

The vessels that had access to the port of Dairen during January, 1921, totalled 309 Japanese vessels amounting to 314453 tons, in addition to 215 foreign vessels amounting to 799,965 tons.

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These vessels may be tabulated as under:—

Incomers (Japanese).

From	vessels	tons
Japan	88	177,273
China	55	112,435
Malay	2	12,490
Luzon	1	9,499
Kwantung Leased Territory	4	2,754

Outgoers (Japanese).

To	vessels	tons
Japan	97	195,194
China	53	81,583
Kwantung Leased Territory	4	3,003
Java	1	4,720
America	3	26,984
Great Britain	1	5,228

Incomers (Foreign).

Flag	From	vessels	tons
China	China	86	68,321
Britain	Britain	1	6,755
„	China	13	27,889
„	America	1	5,925
America	America	3	22,025
„	Hawaii	1	6,888
„	Luzon	1	2,898
Holland	... ...	1	6,550
„	Java	1	4,600
Norway	China	1	1,095

Outgoers (Foreign).

Flag	To	vessels	tons
China	China	83	66,982
Britain	China	12	20,317
„	Denmark	1	6,862
„	Egypt	1	6,755
America	America	1	6,076
„	Sweden	1	6,868
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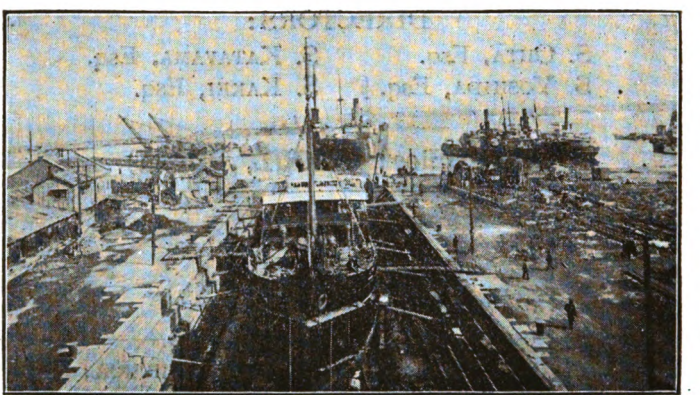

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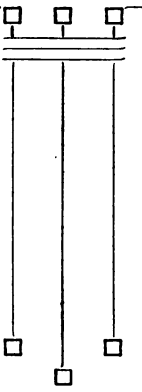

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THE MONTHLY ORGAN OF
THE MANCHURIA ENLIGHTENING SOCIETY.

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THE
LIGHT OF MANCHURIA

ORIGIN AND PROGRESS OF GLASS MANUFACTURE.

At S. M. R. Co. Ceramic Experimental Institute, Dairen.

By Mr. K. Hirano.

The advance and development of industrial enterprises of Japan have been really marvellous. Glass industry, for one, has made a very rapid progress, and Japanese manufactures have been exported briskly to China, India, Australia, etc., the total exports for 1919 amounting to ¥19,000,000. However, this may be interpreted as a transient phenomenon which resulted from the substitution of Japanese manufactures for domestic products in the foreign countries whereto they were exported. For, prior to the great War, Germany, Austria, Belgium, Great Britain, etc., were the principal suppliers. These countries, after meeting their home demands, had sufficient left for export to the Orient, Australia, etc., in which fields they waged a strenuous competition and, by lowering the cost of production and improving the quality of goods, managed to supply manufactures of excellent quality far superior to Japanese products at moderate prices.

The Chinese, too, have had the standard of their living raised, and have come to take a fancy to wares of finer qualities gradually.

Transient as the above phenomenon may be, how should the new markets exploited by the Japanese during and immediately after the great War be preserved and developed? This question must be called one of vital importance to Japan. Especially, such as white hollow ware, which forms one of Japan's staple exports is indisputably inferior to foreign manufactures in point of lustre, transparency, and durability, and also the presence of bubbles. This fact is widely known. It would be the height of madness to offer such coarse manufactures without introducing any improvement, to the world's markets at anything but moderate prices.

Personally, I have long held the necessity to better the situation somehow as claiming the earliest fulfilment.

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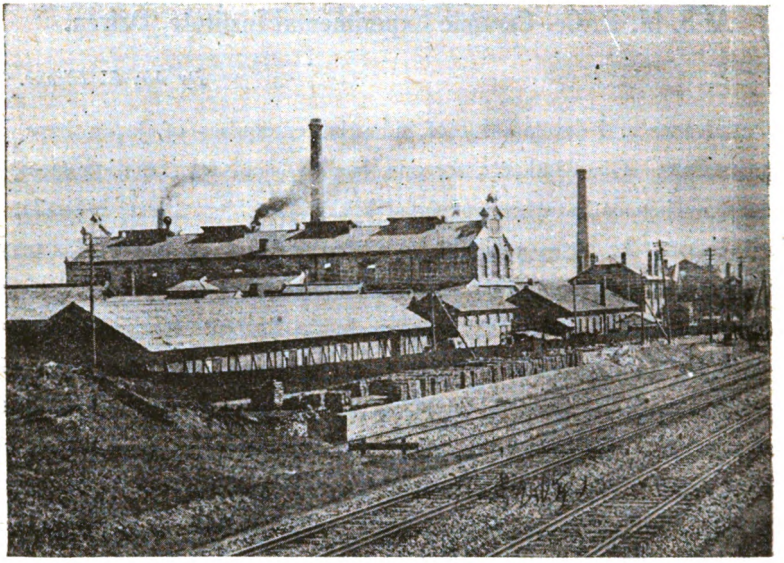
Since as early as 1902, I have been unfolding my views upon the above mentioned necessity at the Industrial Laboratory attached to the Department of Agriculture and Commerce, at meetings of dealers, and on other like occasions.

Also I have raised a cry for the early improvement of pot ovens.



EXTERIOR VIEW OF S. M. R. Co. GLASS FACTORY, DAIREN.

There have, indeed, been some sympathizers who echoed my cry, but, as to its experimental study, it is not of such category as to be taken up at a laboratory, and at least, the minimum scale of a factory is absolutely necessary, which will demand considerable outlay and a good length of time, not to mention the risk attendant thereon. On this account, no business corporation can afford to undertake any such experiment. Then, the Imperial Government is lacking in an adequate institution for its investigation, and for this reason, it has kept its hands off so far.

Since 1908, I conducted a series of study of materials for ceramic industry in the interest of the South Manchuria Railway Company. By 1911, I became convinced of the promising nature of glass industry, considering firstly, that the siliceous stone and limestone abundant about Dairen is suited to glass industry,

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secondly that good coal is obtainable on easy terms, thirdly that the labour wages are low comparatively, and fourthly that South Manchuria, especially Dairen, is most favourably situated for exporting the glass products to the other parts of the Orient.

The South Manchuria Railway Company asked me then to draw up a plan for glass enterprise in addition. My opinion on this point was substantially as follows:—

As to the glass enterprise in Manchuria, the manufacture of white hollow ware is considered suitable at the initial stage of the enterprise, but, so long as no material alterations are made upon the procedures of import of articles from Japan to Manchuria, it would be out of the question to hope for the improvement of quality so as to raise the product to the plane of an international commodity. Therefore, it will be necessary first to investigate how this line of industry is nurtured and carried on in Germany and Austria, and then to decide what plan to take in lines of manufacturing methods.

The above view of mine was accepted by the Railway Company through the support of Baron S. Goto (ex-President of the Company).

In May, 1911, I was sent abroad to Europe by the Railway Company, returning a year later on the completion of my study. I submitted the plan of founding a factory of an experimental nature. The difficulty, however, besetting the proposed enterprise, looked so insurmountable that the plan I submitted was not put in execution.

I kept hammering on the attention of the Company's Directorate with my recommendation to test the merit of my plan, while the experiments in the manufacture of fire bricks and pottery and china ware were kept up.

In December, 1916, Baron Y. Nakamura (then President of the Company) gave a signal for launching the risk-fraught enterprise by way of experiment on the basis of my plan. Consequently, in April, 1917, I was accepted into the Company's service, being entrusted with the construction and equipment of a glass factory, in addition to its experimental operation and management.

Construction work was commenced in 1917. Since it was the very first enterprise of the kind in Japan, in 1917, closed pot ovens and auxiliary ovens, which had passed the experimental tests, were built, and the preliminary experi-

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mental manufacture of white hollow ware was taken up. In 1918, open pot ovens and auxiliary ovens were built for the principal experiment.

On March 1st, 1919, the first fire was kindled in the ovens, and new and various experiments have been conducted. All materials such as raw materials, fuel, fire-proof materials, etc., were of Manchurian origin and were used for the first time in glass manufacture. Besides, the ovens were of a new type to be experimented upon for the first-time. On this account and for sundry other reasons, numerous difficulties were encountered. However, through the effort of the experts connected with the new glass factory, problems regarding the composition of raw materials, the regulation of flames, together with their contact relations, the improvement of the quality of pots, etc., were solved one after another, and in December, 1919, my fondest hope could be realized, and experimental products of superior quality were obtained, and thus my first aim to improve the quality of soda glass could be attained.

The manufacture of other kinds of glass is now under scientific study. However, with regard to hard glass, a product of as fine quality as Jena-glass ware was to be had. The contents of the Glass Factory of the Ceramic Experimental Institute include ovens, a finishing room, and fifteen other buildings, comprising 1,316 *tsubo*, and has a melting oven, an anealing oven, and other ovens, totalling twenty-four ovens.

The present staff of the Experimental Institute consists of fourteen officials and clerks in addition to 139 employees composed of 40 Japanese and 99 Chinese, totalling 381. The products have been offered for trial sale to ascertain how they stand with like wares on the market.

These wares include the following:—

1). Soda glass:
   Glasses for export (principally to Australia).
   Some table ware for the Yamato Hotels
   Articles for lighting use
2). Crystal glass:
   Cut glass table ware.
3). Hard glass:
   Chimneys for safety lamps for use in Colliery pits

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Gas cylinders

Gauge glass (for the use of the South Manchuria Railway Company and the Chinese Eastern Railway)

Medical, physical, and chemical instruments.

4). Special glass:

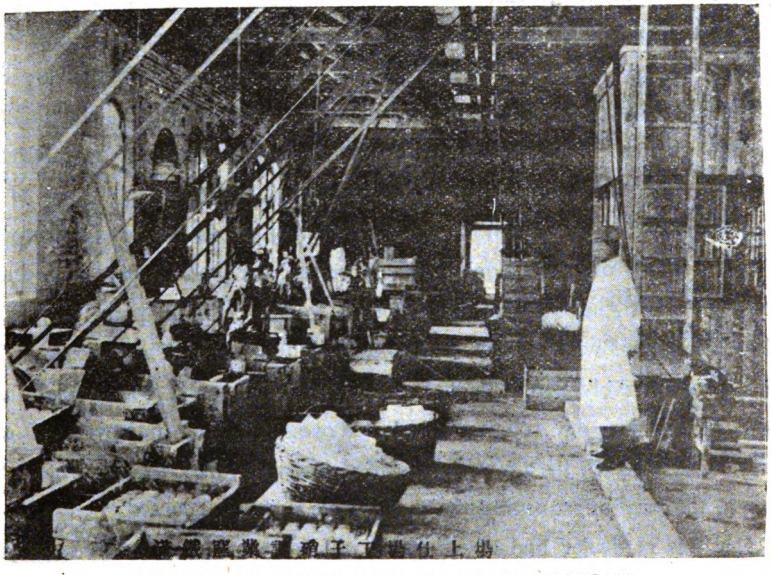
Watch glass

Lens for railway signalling

From April till November, 1920, the manufactures turned out at the Experimental Institute were worth about ¥210,000, of which ¥110,000 worth was exported. The chief article was glasses. The trial sales of these experimental manufactures have led to a long chain of enquiries as to both technical and commercial features of these manufactures. These enquiries have often been accompanied with kindly suggestions or hints.

For instance, in the course of a letter from a certain commercial firm in Japan, there was a passage running to the following effect:—

We are in receipt of the samples of glasses sent to us by you. On inspection of the same, we are satisfied that they are of as excellent a quality as desired by



FINISHING ROOM, S. M. R. Co. GLASS FACTORY.

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our principals abroad, and are superior in several respects to Osaka outputs. In our opinion, they are capable of competing suscessfully with foreign products. The present economic circle belonging to the age of transition, some manufacturers seem willing to quote for their products prices lower than the market prices as per attached list.

American and other foreign wares are offered to the markets abroad at prices cheaper than those for Japanese products, even though the former are decidedly finer in quality than the latter. For this reason, the markets for the Japanese manufactures, as exploited during the past five years, are being gradually encroached upon. It is a situation for the Japanese glass manufactures to get well alarmed. At this juncture, to our mind, the wares turned out at your Institute are the only products that have fair chances of competing well with the foreign manufactures.

I might venture to sound a warning that, in case of the Japanese manufacturers continuing to dream raking in an easy gain as in the War time, with goods of inferior quality, and should persist in the error of turning out poor goods, what would be the future of the glass industry of Japan? The bare idea would send a thrill of shudder through me.

It seems to me that the great task of turning the present situation of this particular line of industry, helping forward the economic development of the Japanese and Chinese in Manchuria by nurturing this indigenous enterprise, and raising the products of the Experimental Institute to the plane of an international commodity, in fact devolves upon the Experimental Institute.

Already, our object of turning out high quality goods has been accomplished, and it is a source of satisfaction to remember that our products have earned a good reputation on the Australian markets. Our misgiving is if, in point of price, our goods can compete with the domestic and foreign wares. This question cannot be solved conclusively except through the practical test on a commercial footing. Among factors for the solution of the above issue, the improvement of the manufacturing method, the training of skilled workmen, the efficiency of the experts and men, the way of managing the factory, etc., my be counted.

How this particular line of enterprise will come out may be looked upon as the pivot on which turns the question whether or not any indigenous industry

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depending for chief material upon products of Manchuria and coal and intended mainly for export will be attended with success.

POSITION OF BEANS IN MANCHURIAN TRADE AND PROPAGATION OF THEIR SUPERIOR BREEDS.

(I) Position of Beans in Manchurian Trade.

By Mr. B. Ito.

Manchuria has come to be associated with Beans; and the word "Beans" now at once calls Manchuria to mind.

What position is occupied by Beans in the Manchurian trade may be judged by the following table:—

	Total trade of Manchuria Hk. Tl.	Total exports of Manchuria Hk. Tl.	Exports of Beans, B. Cake, & B. Oil Hk. Tl.	Rato of Staple Produce exported to Total trade	Ratio of Staple produce exported to Total exports
1912	190,958,739	86,763,295	21,745,333	11%	25%
1913	198,569,023	98,366,115	53,385,073	27	54
1914	193,036,550	95,213,584	53,346,931	28	56
1915	197,805,402	108,482,001	62,184,650	31	57
1916	227,013,031	117,916,327	61,045,657	27	52
1917	261,345,024	127,218,316	66,715,617	26	52
1918	279,438,001	131,470,670	73,931,610	27	56

The above table testifies at what rate the Manchurian trade has been growing year after year. What used to amount to Tael 190,000,000 in 1912 increased in 1916 to Tael 227,000,000, and in 1918 to about Tael 280,000,000, which last mentioned figure, compared with that for 1912, increased by about 47%.

Turning to the three articles of staple produce of Manchuria, viz., Beans, Bean Cake, and Bean Oil, their export, too, has been increasing rapidly. In 1912, their export value totalled Tael 21,700,000; in 1915 it rose to Tael 62,000,000; and in 1918 the total reached over Tael 73,900,000; the rate of increase for 1918 over 1912 was about 240%.

Then, the total export amount of Beans, Bean Cake, and Bean Oil was 11% of the total volume of trade in 1912. In 1915, the ratio went up to 31%, and in 1918 came down to 27%.

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Next, the export total of the three kinds of staple produce amounted to 25% in 1912, 57% in 1915, and 56% in 1918.

In other words, the total exports of Beans, Bean Cake, and Bean Oil have never been less than 25% of the total trade of Manchuria and more than 50% of the total export amount.

It is an actual fact free from exaggeration that the economic Manchuria is revolving round Beans and their products in the form of Bean Cake and Bean Oil.

Beans and their products, Bean Cake and Bean Oil, hold an important place in the trade of Manchuria, and any useful or happy improvement, if introduced into any of them, will have a far-reaching-effect on the trade of Manchuria.

Calculating the aggregate total yield of Beans in Manchuria at 18,000,000 *koku*, and computing the rate of increased crop at 10% from the rearing of superior species of Beans on the basis of the reports submitted by the Agricultural Experimental Station, Kungchuling, etc., the annual increment in production will amount to 1,800,000 *koku* or over 250,000 tons, which is nearly as large a quantity as the annual export amount of Beans from the port of Dairen.

It would be a little too hasty to say that the above mentioned increment can be realized by merely substituting a superior species of seed Beans for what has been sown so far.

The oil percentage contained in Beans is ordinarily 17.5%, but in some cases the percentage is low as only 2 or 3%.

How much Bean is consumed as oil-yielding material is not definitely known, but the total exports of Bean Oil are about 135,000 tons.

Now supposing that, by growing a superior kind of Beans, the increase in oil outputs amounts to 25%, the 25% of the aggregate Bean Oil exports only represents an increased outputs by about 3,400 tons, which, computed on the basis of both gold and silver being on a par with each other, and of the current prices, Beans are valued at about ¥23,000,000, and Bean Oil at ¥500,000, the sum total being ¥23,500,000.

Again, the assets of Beans as a food stuff and fertilizer depend chiefly upon the quantity of albumen they contain.

Ordinary Beans contain from 35 to 40% of ablumen. If by the propagation of a superior kind of Beans in Manchuria, all Manchurian Beans can be made to

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contain 40% of albumen, the increased percentage of albumen to be obtained from 18,000,000 *koku* of Beans goes up to really a considerable amount.

However, so long as Beans are dealt in mainly by the weight, as at present, the increase of the albumen percentage is not likely to influence the price favourably.

As mentioned above, even a slight improvement introduced into Beans will yield a considerable profit.

Then, the interesting questions are: "What is a superior kind of Beans like?" and "How may it be propagated?"

(II) What is a Superior Kind of Beans Like?

Beans may be graduated according to their quality, how easy they are to be cultivated, and also the quantity of harvest. Seen from the point of view of quality, the larger is the percentage of albumen and oil contained the better are the Beans. Next, a superior kind must give the largest quantity of harvest. Thirdly, it is essential that the cultivation of the Beans is attended with ease.

However excellent Beans may be in quality and what a high percentage of albumen and oil they may contain, if they should be difficult of being attended to, and should give a short crop, the farmers would learn to shun any such Beans, which can hardly be called tobeof a superior kind. To be of a superior variety, Beans must contain a comparatively rich percentage of albumen and oil, must be easy to handle, and must yield a full measure of harvest.

From the reports submitted by the Agricultural Experimental Station, Kung-chuling, and also the General Laboratory, Dairen, both of the South Manchuria Railway Company, the following descriptions may be given:—

(A) When oil is the primary consideration:

a) The nearer a perfect globe the grains are, the higher is the oil percentage. The oblong or a oval shaped kinds give a less quantity of oil.

b) Beans of yellow colour tinged with blue. c) Lustrous Beans, and

d) Beans with black or brownish eyes have a high percentage of oil.

e) Those having seed-leaves of deep yellow contain a high percentage of oil, and those having seed-leaves of light yellow a low percentage.

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LOADING BEANS & BEAN CAKE INTO STEAMER.

The oil percentages of Beans of different origins range from 22% to 16%.

Since 1908, the S. M. R\ Co.'s General Laboratory has conducted analysis over Beans produced in North and South Manchuria altogether about 200 times, and the result may be classified as under: —

Oil percentage	No. of times
Over 14%	2
„ 15 „	7
„ 16 „	27
„ 17 „	72
„ 18 „	50
„ 19 „	17
	175

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(B) When albumen is the primary consideration:

a) Contrary to the oil percentage, the albumen percentage is high in the oblong-shaped Beans and low in the perfectly round Beans.

b) Beans of deep blue have the largest percentage; those of blue colour follow.

c) Lustless kinds have a high percentage, and in respect of lustre, the less is the lustre, the higher is the albumen percentage.

d) Beans with deep black or black eyes have a large percentage.

e) With regard to the cotyledons, Beans having seed-leaves of light blue or yellow give a high percentage.

The albumen percentages of Beans of different kinds, as found by means of analysis at the General Laboratory, Dairen, range from 31% to 41%.

(C) When the harvest amount is the primary consideration:

The results of the successive annual experiments, as conducted by the Agricultural Experimental Station, Kungchuling, since 1913, are as under:—

	1913 koku	1914 koku	1915 koku	1916 koku	1917 koku	1918 koku	1919 koku	Average koku
White-eyed (Fengtien)	—	2.037	1.083	1.046	1.266	1.316	0.852	1.267
„ (Kungchuling) ...	—	1.956	1.145	0.926	1.208	1.384	0.809	1.240
White-flowered (Ssupingkai) ...	1.32	1.647	1.110	0.928	1.223	1.293	0.709	1.179
„ (Kaiyuan) ...	1.163	1.630	1.140	0.956	1.256	1.426	0.681	1.176
Black-eyed (Ssupingkai)	—	1.963	0.886	1.117	1.240	1.315	0.674	1.199
Black roundish (Kungchuling) .	—	1.629	1.186	0.922	1.246	1.425	0.844	1.209
Shuangloutzu	—	1.188	1.230	1.102	1.406	1.401	0.914	1.207
No. 2 selected...	—	1.675	1.308	1.066	1.416	1.330	0.767	1.261
Shuangmiaotzu...	—	1.620	1.230	0.991	1.259	1.370	0.772	1.207
Tzulushu	—	1.621	1.296	1.026	1.110	1.367	0.816	1.206
Hsiaerhtai...	—	1.693	1.347	1.012	1.231	1.425	0.843	1.259
Black-eyed (Fengtien)	—	1.749	1.207	1.009	1.291	1.481	0.774	1.240
Erhshihlipu	—	0.874	1.299	1.196	1.161	1.381	0.898	1.135
Ssulihuang (四粒黃)	—	—	—	—	—	—	0.929	0.929
Small black-eyed	—	—	—	—	—	—	1.014	1.014
Paihuatsotzu (白花蘇子)... ...	—	—	—	—	—	—	0.819	0.819

According to the above table, the white-eyed (Fengtien) species gives the largest harvest followed by "No. 2 selected," Hsiaerhtai, and the white-eyed (Kungchuling) species. The Paihuatsotzu and the Ssulihuang are the least productive. The Erhshihtai species is the next lowest.

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(D) When the weight is the primary consideration:

The returns prepared by the Agricultural Experimental Station, Kungchuling, give the following:—

	1913	1914	1915	1916	1917	1918	1919	average
	momme	momme	momme	momme	momme	momme	momme	momme
White-eyed (Fengtien)	—	339	342	349	347	352	345	346
„ (Kungchuling) ...	—	339	344	345	346	351	348	345
White flowered (Ssupingkai) ...	343	340	336	345	344	349.5	341	343
„ (Kaiyuan)... ...	342	340	344	343	344	352.5	345	344
Black-eyed (Ssupingkai)	—	332	344	349	347	356	346	346
Black roundish (Kungchuling) ...	—	327	339	334	344	350	339	339
Shuangloutzu	—	340	348	348	344	353	345	346
No. 2 selected	—	339	343	341	341	350.5	339.5	342
Shuangmiaotzu	—	339	345	343	347	351	342	345
Tzulushu	—	340	346	343	346	349	341	344
Hsiaerhtai	—	339	349	343	346	350	338	345
Black-eyed (Fengtien)	—	344	352	332	351	353	345	346
Erhshihlipu...	—	344	351	342	346	350.5	341	346
Ssulhuang (四粒黃)	—	—	—	—	—	—	332	332
Small black eyed	—	—	—	—	—	—	347.5	347.5
Paihuatsotzu (白花蛙子)	—	—	—	—	—	—	346	346

On the whole, it may be said that Beans having a full weight are found excellent in quality. Especially, since business in Beans is transacted by the weight, as the general cutom is, it will do well to select for seed-beans such kinds as have a full weight.

A study of the above mentioned will easily show that one cannot seek in the same kind of Beans a high percentage of albumen which make them suitable for food-stuff or fertilizer, combined with a large quantity of oil befitting them as a fine oil-yielding material.

In other words, such kinds as contain a high percentage of albumen possesses a smaller quantity of oil, and vice versa. This point ought to be taken into consideration at the time of selecting the seed beans. Since Beans now serve as material for the manufacture of both Bean Cake and Bean Oil, the selection of the seed-beans is rather a trying question. However, seen from the general situation of the fertilizer and fat markets, Bean Oil appears destined to be in increasing demand both as a food-stuff and for industrial uses. On this account, Beans may be valued more highly for the sake of Bean Oil they yield than for the sake of Bean Cake they give.

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One thing that may be mentioned in this connection is that such varieties as blue beans (青豆), black beans (黑豆), oil beans (油豆), white-flowered beans (白花子), white-eyed beans (白眉) and golden grains (金元豆) are not included in the list of beans acceptable for the Bean Mixed Storage to the South Manchuria Railway Company. All these varieties are treated specially on the owners' request as superior or special kinds.

However, such as golden grains, which are smaller in size, may give a somewhat higher percentage of oil, but, compared with Beans of larger sizes, they leave a larger quantity of residue because of their skin. Again, as material for making *tofu* (bean curd) and a food-stuff giving albumen, they contain much coarse fibre and ash. For the same reason, they produce Bean Cake of a less desirable quality. The question how golden grains compare with white-eyed beans, for one, calls for a good study.

We have stated above that, to be called beans of superior quality, they must be rich in oil and albumen, must be easy to cultivate, and must give a large harvest.

What particular varieties fill all these requirements must be determined by competent specialists. The next questions to be taken up are: How are the superior kinds of Beans to be reared and how can these kinds be propagated?

(III) How to Propagate Superior Kinds of Beans and How to rear them.

(a) Nursery Farms and Propagation Farms.

In order to propagate Beans of superior varieties, arrangements must first be made for the selection of seeds, nursery, and propagation.

In other words, nursery farms and propagation farms must be provided for. Nursery farms are to protect and rear such superior kinds of Beans as suit the soil and climate of one particular locality, and one may suffice for one District Superintendency. Propagation farms are to propagate the superior variety of Beans obtained from the nursery farm for distribution to the district. One such farm may be necessary for each Prefecture.

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On the above calculation, about a dozen nursery farms will be wanted for all Manchuria. For the laying-out and maintenance of these nursery farms, the South Manchuria Railway Company, which is adequately equipped both financially and technically, seems to be the right party to undertake the task.

As to the propagation farms, they should be taken up by the Chinese authorities and people who are to reap the benefit of the propagation of superior kinds of Beans.

China, from time immemorial, has like a mercantilist, allowed her people a free rein to give a full play to their enterprise and push, so far as industrial and commercial activities are concerned. The Government has never interfered. One of its political maxims is that it would be better far to remove one evil than to create one profitable enterprise. To expect the Chinese Officialdom reared in such atmosphere and situated in the financial straits as it is now in, to go to the length of defraying a considerable sum of money for propagation of Beans of superior kinds would be next to impossible.

Even China has such strong champions striving in the cause of industrial and commercial utilities as Mr. Yen-hsishan, Mr. Chang-chien, etc., but such enthusiasts may be considered as valued rarities, and it is open to question if Manchuria can point to any of her sons with a just pride as an equal to them.

Under such circumtances, there is no other way but for the South Manchuria Railway Company to extend the existing arrangements of its agricultural experimental stations as the kernels of enterprise and so to fill the sorely-felt need.

One point that may be held up as a subject of attention in connection with the propagation of superior kinds of beans is the native method of purifying cereals in Manchuria.

Why the cereals produced in Manchuria have been of indifferent quality may be ascribed in a measure to the slovenly way of cultivation, but more largely to the presence of extraneous matter owing to the faulty purification. So long as there are other than superior kinds of beans grown by the farmers in Manchuria and provided the time honoured method of purification remain in vogue, the mixture of undesirable matters will be inevitable. Therefore, nothing but superior kinds ought to be permitted to be raised, and an unfailing supply of the same kinds should be put within easy reach of the farmers.

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(b) Co-operation with Chinese Authorities.

How can the superior varieties be reared on the nursery farms and propagation farms be propagated? To do this in an approved manner, co-operation with the Chinese authorities is a matter of paramount importance. The parties to be directly benefited by the propagation of the superior varieties are the Chinese, and what good to be shared by the South Manchuria Railway Company and the Japanese in general in Manchuria is only in an indirect way, and that in a much smaller measure. Such being the case, the Chinese authorities ought to take upon themselves the onerous work of improving the cultivation method and also propagating the superior kinds. However, as things are in China, it would be more than strictly reasonable to expect all this from the Chinese authorities. Still, it would be not only practicable, but also the most effective to reason them into co-operating in good earnest and carrying on the propaganda work among the farming classes and produce dealers, through whose hands Beans, etc., are placed on the market, to the end of making the farmers select nothing but superior kinds of Beans. But, the difficulty of convincing the Chinese authorities of the advantages of growing superior varieties and inducing them to keep up a propaganda movement amoung the farmers in order to bring the latter to take the same view must be fully appreciated. However, the Chinese peasantry, with their proverbial longing for the main chance, are believed to take readily to any departure that they know will gain them a larger and surer profit. Therefore, once they have come to a good understanding of the real merit of the new proposition, the propagation of superior kinds may prove much easier than at first thought.

In a word, a good deal depends upon securing the hearty co-operation of the Chinese authorities, agricultural and commercial guilds, and produce dealers in the worthy enterprise of propagating superiour kinds of beans.

(c) Examination of Beans.

In connection with the propagation of superior kinds of Beans, the examination of Beans must be carefully considered. The strongest inducement to be offered to the Chinese farming classes and produce dealers, whose mental acumen

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is slow to grasp the benefit of selecting superior seed-beans, will be to confront them with increasing harvest returns to be cleared from the adoption of superior kinds.

In drafting the regulations concerning the examination of Beans, competent agricultural experts should be consulted, and the superior kinds of Beans intended for eventual propagation all over Manchuria should be selected, and this same superior variety should be placed at the head of the list of Bean varieties acceptable for Mixed Storage by the South Manchuia Railway Company. Then both farmers and produce dealers, stimulated by the odds in favour of the superior Beans, will be speedily converted into enthusiasts for growing nothing but superior Beans. Mere words, however eloquently spoken, will not impress profoundly the Chinese farmers and produce dealers. If the prices of superior kinds of Beans should be suffered to remain as low as other less favoured kinds, no amount of reasoning will have the desired effect on the Chinese mind.

(d) Revision of Mixed Storage.

As already stated, none of the following varieties of Beans—golden grains, white-flowered beans, white-eyed beans, oil beans, blue beans, and black beans—is included in the list of varieties acceptable for Mixed Storage. All of them are given a special handling. In fact, apart from blue and black beans, all the rest are entitled to be ranked as superior varieties. However, because of their exclusion from the Mixed Storage list, each kind is charged 2.6 sen higher per ton in storage charge and 10 sen higher per ton each in charges for receipt into custody, removal from custody, and reshifting. Since these superior kinds are higher-priced than the Mixed Storage varieties, the difference of 12 sen or so per ton will not matter much. But if their propagation as superior kinds is desired at all, they ought to be included in the Mixed Storage list as a super-excellent variety, so that the farmers and produce dealers may not pass over them as merely special kinds of beans.

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SHEEP FARMING IN EASTERN PART OF INNER MONGOLIA AND SOUTH MANCHURIA.

By Mr. K. Matsushima.

(1) General Review of Sheep Farming.

Sheep farming in South Manchuria (the Eastern Part of Inner Mongolia being excepted) is confined to the mountainous country known as the Tungshan (Eastern Hill) District lying east of Kaiyuan, and also the hilly district south of the Mukden-Antung Line. In these regions, sheep farming is taken up by the Chinese peasantry as a bye-industry. Along the South Manchuria Railway lines, there is no area available for sheep farming. Even in these hilly territories, since the meat is a more important asset than the wool, and goats propagate more rapidly, goats are becoming greater favourites than sheep. In the hilly country south of the Mukden-Antung Line, wild silk worm raising proves a more lucrative enterprise than sheep-farming, which, on this account, is being pressed down gradually. In South Manchuria, the total number of sheep is put at 400,000 head.

Sheep-farming in the Eastern Part of Inner Mongolia may be classified into vocational and by-industrial. The Mongolians are generally engaged in the former, and the Chinese settlers in the latter.

How the land area in the Eastern Part of Inner Mongolia is being utilized may be seen from the following table:—

Agricultural zone	50%
Agricultural and stock-farming zone	30%
Stock-farming zone	20%

The stock-farming zone extending over the full length of Eastern Mongolia has been gradually reduced as the agricultural pursuits have flourished at the expense of stock-farming.

It seems that stock farming will be eventually restricted to the area outside the margin of agriculture and to part of arid waste land.

On the other hand, from the nature of the agricultural method in Eastern Mongolia, sheep-farming as a by-industry is becoming more popular, especially in

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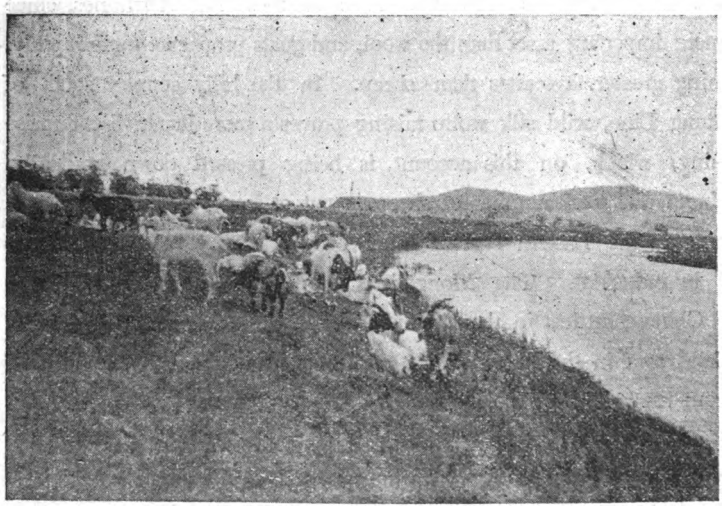
the territory under the jurisdiction of the Military Governor of Jehol. The sheep kept in the Eastern Part of Inner Mongolia are estimated to have been roughly 1,400,000 head, decreasing as the result of the great European War to about 1,300,000 head.

(2) Object of Sheep Farming.

The Mongolians, in engaging in sheep-farming as the principal pursuit, have in view the double product of mutton (for domestic consumption and also for sale) and sheep-skins.

With the Chinese settlers, who take up sheep-farming as by-industry, they, in addition to the dual chief asset of mutton and sheep-skins, mean to turn to good practical account the slack time hanging on their hands outside the busy farming season, and other advantages afforded by the sheep. In summer, the sheep are turned out to the adjoining unemployed field; in winter they are put in the harvested field and fed on the stalks, roots, etc.



SHEEP FARMING IN MONGOLIA. (View 1.)

Since Mongolian wool came to be exported abroad some forty years ago, the natives have opened their eyes to the advantage of producing wool, and now a general calculation prevailing is that in sheep farming, the mutton, together with the skins and lambs, suffice for the cost of up-keep and management, whilst

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the wool can be set apart as net profit. The annual wool output is 3 lbs. per head which is worth about 75 sen in Chinese small silver coins.

(3) Kinds of Sheep and their Propagating Capacity.

The Mongolian sheep belong to the fat-tailed breed of the long tail breed, and is of the mixed breed (giving a mixture of wool and coarse wool), if classified by the wool.

Judged by the appearance, the head, neck, and legs are slender for the body, and they may be called more properly butchers'sheep. A ewe weighs from 58 lbs. to 91 lbs, and a ram from 83 lbs. to 133 lbs. Some have horns; others have none. Many have black or brownish spots on the head, neck, etc. They attain maturity in two years.

Seen from the utility of the wool, it belongs to a coarse variety, mixed with much dead hair. Ordinarily, it is good for spinning yarn of W 10-12 (the grade of fineness of wool 1/1200 inch and coarse wool 1/300 inch). The wool output is 200 *momme* (or 1,666 lbs.) in spring and 1.25 lbs. in autumn, the annual total being 2.9 lbs. per head, which makes a very poor showing.

The wool lacks uniformity and is coarse, and, for this reason, is unfit to produce a fine textile. However, the lamb's skin is passable in curls and other respects. The mutton is of an excellent quality to the extent of 45% of the whole body on an average.

As to the propagation, more or less variation is observed between those in Mongolia and Manchuria, from the difference in feeding, management, etc. However, the breeding of lambs to 100 head of grown-up ewes is 80%, whilst 75% of lambs attain maturity. In other words, 100 head of grown-up ewes give about 60 head (evenly divided between ewes and rams) of lambs.

The death rate of grown up sheep ranges from about 10% to 15%.

The Mongolian sheep used to be quoted at S.¥5 in C. s.s.c. in ordinary times, but now the price is fluctuating about S. ¥6 in C. s.s.c.

(4) Feeding and Management.

In regard to feeding and management, it may be taken for granted that there is a difference between those reared by way of the principal pursuits and of a

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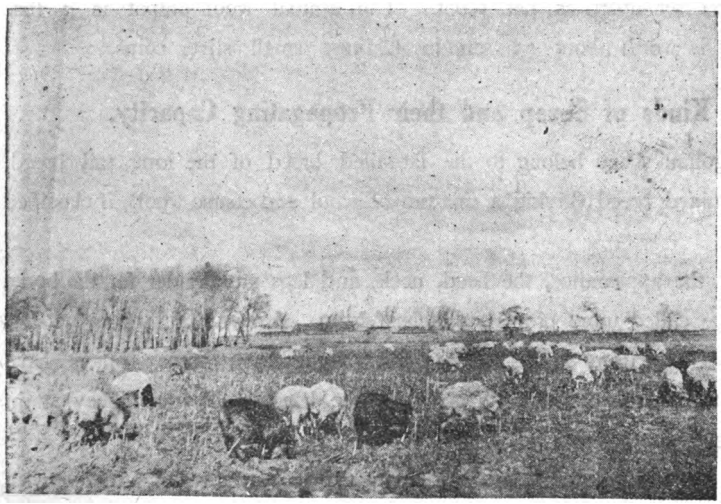

SHEEP-FARMING IN MONGOLIA. (View 2.)

by-industry. However, in a word, in Mongolia, sheep are let loose all the year round, and no kraal worth the name is provided, except enclosures made of boughs, etc. The sheep are naturally after grass and water, and they get fat on the green grass in the warmer months, but they become lean in winter. Some lay by hay for winter use, but such cases are only rarely met with. Rich feed and salt are given in but few cases and only in small quantities.

In cases where sheep are reared as a by-industry, they are turned out on the pasture in summer, and in winter they are usually kept inside fenced inclosures or something resembling sheep-folds. As to feed, hay or the straw or stalks of some kinds of cereals grown are given. In some cases, rich feed is given, and an amount of care is shown in giving water and salt.

In Mongolia, the natives belonging to one principality are at perfect liberty to nomadize anywhere within the confines of their own principality. In the rest of Mongolia and in Manchuria, the same liberty is allowed, except where the titles to land are well established.

In the open level country of Mongolia, an experienced shepherd on horseback may watch over 1,000 head of sheep, but ordinarily 500 head is regarded as the maximum for one shepherd. In the districts under cultivation, the maximum is lowered to 200 head. In most cases, sheep and goats are raised together in the same flocks. Goats are swifter in pace and are bolder. Besides their propagating power is somewhat larger. These peculiarities are said to make for a mixed farming.

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Generally among a hundred head of sheep thirty heads of goats are found, with allowances for a variation according to localities.

Commonly, to one ram thirty ewes are assigned. The breeding season runs from August to October and the young are brought out after the following January. The lactation period for the young terminates in four months' time.

Milking is not practiced except in the country west of the Hingan Range.

Castration is practiced on lambs when a few months old, but this is confined to the Mongolian keepers.

The wool is shorn twice a year, in spring between the latter part of May and early June when the wool begins to fall off, and in autumn from the end of August to the middle of October.

In gathering the wool crop, combs and shears are used.

The Mongolians use shears, but some Chinese employ combs, although the latter practice is limited to the country about Chahar in the Eastern Part of Inner Mongolia.

SHEEP-FARMING IN MONGOLIA (View 3.)

Lately, as wool is dealt in by forward contract, employees of the dealers who have contracted for the purchase of the wool are seen harvesting the wool.

The wool crop is packed in gunny bags and sent away in many cases, and hemp ropes, cotton bags, or straw mats are only seldom used for packing purposes.

The popular method of packing known as packing in hides in vogue in Western China is unknown in Mongolia.

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(5) Utility of Sheep Products.

Sheep's milk is taken by the natives in that part of Mongolia lying west of the Hingan Range and is also used for the manufacture of "chakantos."

The mutton is used as daily food, and even the meat of dead sheep is eaten without instinctive aversion.

The Lamaists partake of mutton most freely in August and September.

Sheep's skins are tanned with milk by the Mongolians to be used as clothing. The Chinese use sodium sulphate for tanning purposes, but the largest portion of the skins is sold as they are.

Wool is used also for the making of rugs, socks, etc., the manufacture of which is, however, undertaken by few wool producers.

(6) Diseases.

Apart from such animal epidemics as anthrax and foot and mouth disease, the diseases that are a constant menace to the live stock include the parasitic existence of oesophagostomum columbianum and haemonchus contortus which are the two kinds of worms invariably found in all kinds of live stock in all countries, and form one of the important points in sheep raising.

(7) Number of Sheep and Their Distribution.

The sheep now kept are estimated to be about 400,000 head in South Manchuria and about 1,400,000 head in Eastern Part of Inner Mongolia, which are distributed roughly as follow:—

	Head
About Nungan ... ... (raised as by-industry)	35,000
About Fakumen, Paiyintala, Kailu, and Hsiao-Kulun ... ... (desert sheep)	60,000
About Chinchow... ... ... (raised as by-industry and excellent wool put out)	215,000
About Chihfeng, Jehol, and Chingfeng ... ... (mostly raised as byindustry and sheep are undersized)	200,000
About Dalainor	120,000
Northwest of Linhsi, Chingfeng, and Dalai Nor	180,000
About Alkolchin	160,000
North of Paiyintala and southwest of Taonanfu	120,000
North of Taonanfu	110,000
North of Linhsi	230,000

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In South Manchuria, sheep-raising is undertaken by the Chinese farmers in the hilly country, and in the Eastern Part of Inner Mongolia, the arable area has been reclaimed gradually and placed under cultivation, and now what may be regarded as suited to be stock farms has been confined to the area outside the margin of agriculture, the low damp land in the Talaihan principality, and the desert land in the Powang principality.

Even in the district which has once been under cultivation, as the case is in Chinchow and Chihfeng, sheep farming has been adopted as a secondary enterprise from the consideration of agricultural management, and this method of sheep-raising is assuming an important proportion.

(8) Sheep and Sheep Products ; Their Demand & Supply.

(1) WOOL.

(a) Demand and Supply.

The wool outputs in the Eastern Part of Inner Mongolia and South Manchuria amount to about 5,400,000 lbs. Those produced about Chinchow are of the finest buality, it becoming less fine as it goes northward till the products placed on the Hailar market are of the poorest grade.

SPECIMEN OF MONGOLIAN SHEEP.

What is consumed within the

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bounds of the producing zone amounts to 1,400,000 lbs., whilst all the exports put together reach some 4,000,000 lbs. The major portion is shipped to the United States via Tientsin, and some to Japan, Chihli and Fengtien Provinces, etc.

(b) Wool Centres and Distribution Amounts.

Markets.	Distribution amounts.	Remarks.
Fengtien (Mukden)	150,000 lbs.	Prior to the Great War, supplies used to be brought chiefly from the Tungshan District (the distribution amount being 100,000 lbs. in ordinary times) and Hsin-mintun (the distribution amount being 30,000 lbs. in ordinary times) and a few Mongolian centres. Out of these supplies only some 100,000 lbs. were used for the manufacture of brushes, etc. Since the War time, the Japanese dealers have come in for a share, and now part of the products gathered at Taonanfu, Chengchiatun, Hsiao-Kulun, Chinchou, Hailar, etc., are also brought to Fengtien (Mukden) the total business reaching about 600,000 lbs. per annum.
Taonanfu	100,000 lbs.	In ordinary circumstances, the stocks are forwarded to Chinchow and Tientsin via Yingkou, but some of them now finds its way to Fengtien. The local consumption for manufacturing purposes amounts to 30,000 lbs.
Chengchiatun	100,000 lbs.	The export conditions are much the same as Taonanfu. The local consumption is put at 20,000 lbs.
Hsiao-Kulun	50,000 lbs.	Ordinarily, the stocks are exported to Chinchow and Tientsin, but nowadays quite a good deal is put on the Fengtien market. The local consumption is 10% of the distribution amount.
Chinchow	900,000-1,000,000 lbs.	400,000 lbs. are brought from Chihfeng and 350,000 lbs. from the districts about Chinchow. In ordinary circumstances, the major portion is forwarded to Tientsin, but since the War time, about 50% has come to be exported via Fengtien (Mukden) through Japanese dealers. The local consumption, 60,000 lbs.
Yichow,	45,000 lbs.	The major portion is forwarded to Chinchow.
Chaoyang,	100,000 lbs.	" "
Chienchang,	90,000 lbs.	" "
Chihfeng,	1,900,000-2,000,000 lbs.	Stocks are brought from Linhsi, Wutancheng, Chingpeng, etc., to the total amount of 1,400,000 lbs., of which over 70% is forwarded direct to Tientsin and 20% to Chinchow, the remaining 10% being for the local consumption.

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Markets.	Distribution amounts.	Remarks.
Linhsi,	120,000 lbs.	The major portion is sent to Chihfeng and a small portion to Kalgan.
Wutancheng,	600,000 lbs.	The larger portion is put on the Chihfeng market.
Chingpeng,	130,000 lbs.	The major portion is sent to Chihfeng and most of the remainder is forwarded to Kalgan via Dolon Nor, the local consumption being 40,500 lbs.
Dolon Nor,	500,000 lbs.	The larger part is put on the Tientsin market, and some to Kalgan, 80,000 lbs. being the local consupmtion.
Kalgan,	600,000 lbs.	The wool outputs in the Eastern Part of Inner Mongolia, which are forwarded direct to Tientsin from Dolon Nor, Chingpeng, and Chahar, are forwarded via Kalgan.
Hailar & other centres along Chinese Eastern Railway	600,000 lbs.	The larger portion comes from Uzmuchin district and the goods so collected are exported to Germany and Russia.

From the above, it may be seen that the wool produced in the Eastern Part of Inner Mongolia and South Manchuria, although its distribution has been somewhat altered since the great world war through the medium of the Fengtien (Mukden) market, is being, for most part, forwarded to Tientsin, while a portion is booked to Europe via Siberia, exclusive of 1,400,000 lbs. for the total domestic consumption.

The distribution conditions are as under:—

Northward exports (for Hailar, etc.)	600,000 lbs.
Southward exports (for Tientsin)	3,400,000 „

Distributed as under:—

via Kalgan	600,000 lbs.
via Chihfeng	1,400,000 „
via Chinchow	900,000 „
via elsewhere such as Yingkou, Dolon Nor, Wutancheng, etc.	500,000 „

(c) Business Method.

1. Direct business with producers:—

What is carried out by the producers themselves
What is takenout by caravans
What is put on the market by the Chinese dealers resident in Mongolia
What is gathered by the innkeepers and furdealers of the different markets
What is bought by agents of foreign merchants.
What is bought by compradors or employees of foreign merchants.
What is bought by wool brokers of Tientsin.

Of the above, the most influential factor worth careful following is what passes through the hands of the compradors or employees of foreign merchants

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FAT-TAILED BREED OF MONGOLIAN SHEEP

who keep in their service a large number of such agents for the purpose of collecting wool. These agents, prior to the shearing season, send out their men to the different producing centres to sign future contracts in consideration of the earnest money they pay. When the shearing season sets in, the same agents will send their men to the places of their bargains to shear the wool contracted for.

2. Business on the markets:—

On the different markets, which have their own peculiar features, what is carried out by the producers themselves or the caravans from the producing centres is disposed of mostly through the medium of the furdealers and the agents of foreign merchants. At present, the major portion of the stocks is raked up together at the producing centres through the agents of the foreign dealers and is shipped to Tientsin. The number of the stages of the intermediate brokers or dealers is being gradually decreased.

In case of the business being transacted on the market through brokers, both sellers and buyers will have to pay each a fee equivalent to 2% ad valorem. In some cases only the sellers will have to pay the 2% fee. In other cases, the sellers will be asked to pay 3% and the buyers 2%.

The weight standard in business transactions is the *kin*. However, the weights are far from uniform, and besides, the *kin* consists at some places of 16 *liang* and at other places of 18 *liang*, which differences should be borne in mind.

Chinese wool is considered to contain impurities generally to the extent of 20% and some times even above that. These impurities are thrown in on purpose

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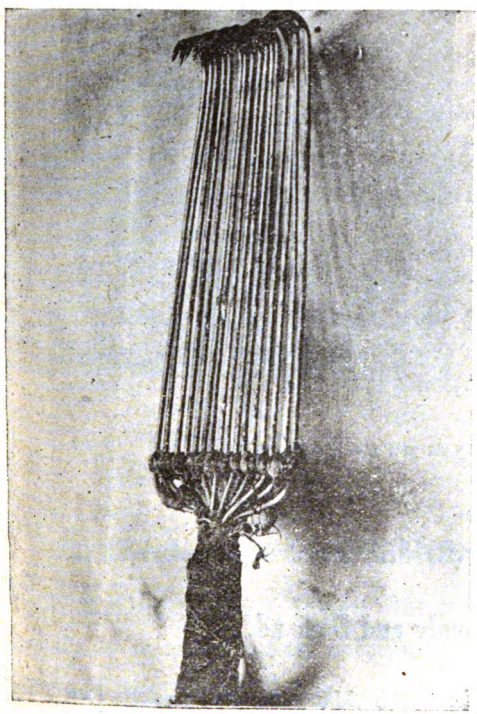
by the more cunning dealers, or by the cart drivers who have stolen some of the wool to make up for the lost weight. Sand and dirt are put in to cheat in weight, and it has been noted in extreme cases sand is found pasted to the wool with gruel or animal fat.

d). Prices.

The prices per Chinese *kin* were as under:—

	Fengtien (Mukden)	Chinchow	Chihfeng.
1911	... Y25	25	25
1914	30	33	25
1917	53	55	45

e). Arrival Season; Packing Method; Cartage and Freights and Export Duty.



WOOL COMB.

1. Arrival Season:

Spring wool is put on the market between June and September.

Antumn wool is sent to the market from September to October.

Antumn wool is some times mixed with the Spring crop of the following year and is put on the market.

2. Packing Method:

What is carried out of the producing centres is packed in gunny bags or is made into bales by means of hemp ropes. What is carried on the back of donkeys weighs from 50 to 60 Chinese *kin* per bale generally

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and such as is forwarded on the back of ponies or by carts weigh 100 Chinese *kin* per bale.

What is exported from Tientsin is compressed into gunny bags and weighs 400 Chinese *kin* per bale.

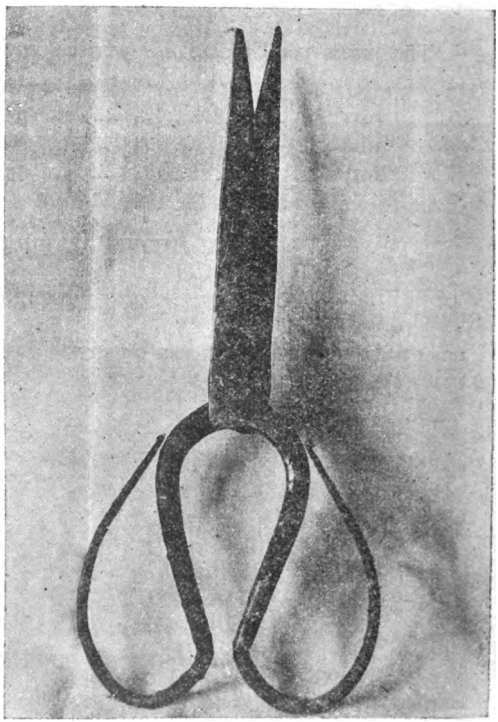
3. Freights and Cartage.

In Mongolia, cartage costs from 25 to 40 sen in Chinese small silver coins per 100 Chinese *li* or about 33 miles per 100 Chinese *kin*.

Railway freight; from Fengtien (Mukden) to Tokyo via Chosen G.¥1.90 per 100 kin or 133 lbs. (besides 25 sen per 100 kin as terminal charges).

(4) Export Duty:

Fee for the issue of a transit permit 5 maces; Transit duty, Tael 1.75 per 100 Chinese kin; Export duty, Tael 3.50. At places, the dredging expense of the harbour is assessed in part on the vessels and cargoes. Transit tax levied in terms of Likin Tax Regulations. According to the Jehol Tax Regulations, 14 sen in large dollars per 100 Chinese kin is assessed as production tax; according to the Fengtien Province Tax Regulations, 1.5% *ad valorem* is levied as production tax in addition to a surtax amounting to 10% of the production tax.



SHEARS.

(5) Marine and Fire Insurance:

For between Fengtien and Tokyo, 15 sen per 100 kin or 133 lbs.

(B) SHEEP.

(1) Supply and Demand.

What is put out annually in South Manchuria and Eastern Part of Inner Mongolia as butchers' sheep numbers 450,000 head in round numbers. Of this

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number, what is for the consumption of the sheep-raisers themselves is put at about 250,000 head, leaving the balance of 200,000 head for sale on the market. It may be added that for the use of the sheep raisers, some 200,000 head of dead sheep in addition to the above mentioned 250,000 head, are available annually.

(2) Markets and Sheep Stocks.

Markets	Sheep put on the market	
Chengchiatun	10,000 head	The major portion is sent to the S. M. Railway Area.
Taonanfu	4,000 „	The major portion is forwarded to Harbin, and part thereof to along the S. M. Railway Lines.
Kailu	1,000 „	Nearly the whole is sent to Hsiao-Kulun and Chengchiatun.
Hsiao-Kulun	1,000 „	The major portion is sent out to Fengtien.
Markets along S. M. Railway Lines.	40,000 „	All of them are for the local consumption.
Markets along Chinese Eastern Railway	40,000 „	„
Chinchow (this side Shanhaikwan)	2,500 „	„
Chihfeng	50,000 „	Of this number 8,000 head are for local consumption and the 42,000 head left are sent to Peking and Tientsin.
Wutancheng	20,000 „	70% sent to Chihfeng and 30% to Peking and Tientsin.
Linhsi	5,000 „	The major portion sent to Chihfeng
Chingpeng	10,000 „	60% to Chihfeng and 40% to Peking via Kalgan.
Dolon Nor	40,000 „	2,000 head for local consumption; the rest is forwarded to Peking via Kalgan.
Kalgan	50,000 „	The major portion is sent to Peking.
Elsewhere	10,000 „	For consumption at different places.

The above may be summed up as follow:—

Markets along Chinese Eastern Railway	40,000 head
Consumption in South Manchuria Railway Area	42,500 „
„ in Eastern Part of Inner Mongolia	20,000 „
„ in Peking and Tientsin	98,000 „
Total	200,500 „

(3) Distribution at Different Markets & Method of Dealing.

The distributions at the different markets in South Manchuria are conducted principally by means of a direct purchase by Lamaists (who are debarred from partaking of pork because of their creed) and the keepers of Chinese restaurants, inns, etc.

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In Eastern Part of Inner Mongolia, things are somewhat different and the sheep are brought to the markets for distribution to places of consumption. What is from the places of production, unlike wool, mainly consists of what has passed through the hands of caravans and peddlers and represent about 60 to 70% of the total arrivals.

The remainder is exported direct by the cattle-dealers, inn-keepers, and dealers at the markets, and also Mongolians themselves.

What is left of the sheep placed on the different markets after the local demand has been met is exported to South and North Manchuria and Peking way.

Of late, many horse-deales and restaurant keepers from Peking, Chinchow, Fengtien, etc., visit the different markets to buy sheep.

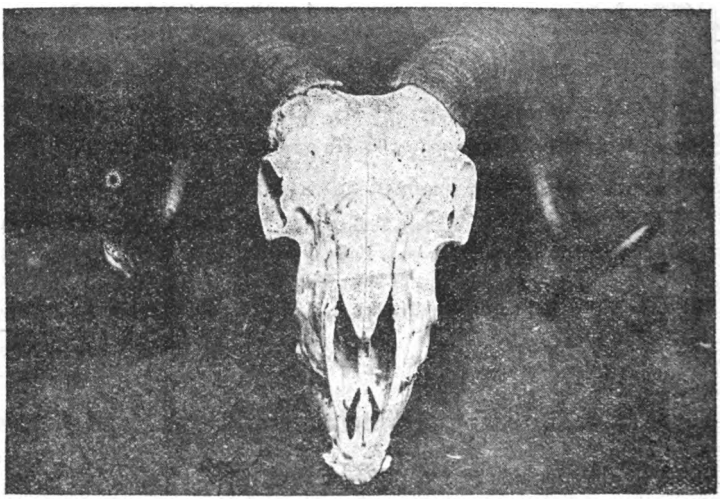
Dealings on the market may be placed under two heads:—

What is transacted on the cattle market as at Kalgan, Dolon Nor Chingpeng, Linhsi, Wutancheng, Chihfeng, Kailu, and Chinchow.

What is transacted at Taonanfu, Chengchiatun, and Hsiao-Kulun, none of which has a cattle market.

At such places as have no cattle markets, under the second head mentioned just above, the business methods of the dealers are, on the whole, well developed, and the influence of the horse-dealers or other middlemen is quite limited.

Where there are cattle markets, some of the middlemen like horse-dealers, etc., have raised themselves to important factors on the market and exercise an influence not at all to be despised.



SKULL OF HORNED SHEEP.

Business on the market is usually carried on through the middlemen who charge as fee 5 to 10 sen per head in small silver coins upon both seller and

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buyer. When the sheep are kept temporarily on the premises of an inn, a trifling charge is made therefor, but since the sheep are generally turned out on the field near the market, such instances are rare.

According to the Jehol Tax Regulations, at a market 4⅔ sen in large dollars per head is charged on the buyer as production tax. Again in case of export, 2.2 sen in large dollars per head is levied as transit tax.

By the Fengtien Province Tax Regulations, 5 *sen* in large dollars, 2½ *sen*, and again 2½ *sen* are levied per head as bargain tax, surtax, and transit tax respectively.

As regards the appearance of sheep at the market, in South Manchuria, they are brought to the market in large numbers during the months of July, August, and September.

In Eastern Part of Inner Mongolia, the height of the sheep season is reached about the same time as the caravans return home, that is, in the Eighth and Ninth Moons by the old Chinese Calendar, in which months the sheep are found in the finest condition aud weigh the heaviest.

Prices vary more or less according to the markets, but from 15 to 20 *sen* in small silver coins per Chinese *kin* is accepted as the standard price for mutton. The buyers reckon the meat of a sheep to weigh as much as 40% of its whole weight and pay accordingly. Ordinarily the mutton itself is considered to enable the buyer to recoup the price he has paid for the sheep; the skin is enough to meet the slaughtering expenses; and the bones, fat, and entrails form the net profit.

As already stated, a Mongolian sheep used to be quoted at about S.¥5 in small silver coins per head before the war, but now the price has gone up to about ¥6 per head.

(C) SHEEP'S SKINS.

(1) Supply and Demand.

The skins of full grown sheep put out in South Manchuria and Eastern Part of Inner Mongolia may be regarded as composed of 200,000 pieces yielded by dead sheep, 250,000 pieces given by the slaughter of sheep for domestic consumption, and 60,000 pieces available from the slaughter of sheep on the markets, totalling 510,000 pieces. To this may be added 200,000 skins of dead lambs, raising the aggregate to 710,000 pieces. Of this aggregate, 200,000 pieces may be put down as for domestic consumption, the remaining 510,000 pieces being

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placed on the market. Of those put on the markets such as Fengtien (Mukden), Chinchow, Dolon Nor, and Kalgan, some 250,000 pieces are for the local consumption in the form of tanned furs and the remaining 260,000 pieces are exported elsewhere.

Seen from the kinds of skins, lambs' and sheep's skins (bearing long wool) are for most part set aside for local consumption or are made into tanned furs on the different markets. The skins, which have had the wool shorn, are, as a rule, exported to Tientsin, et cetera.

(b) Markets and Distribution Amounts.

Markets	Distribution amounts	Remarks
Chengchiatun	15,000 pieces	Major portion sent to Fengtien and Yingkou.
Taonanfu	5,000 „	„
Hsiao-kulun	1,000 „	70% exported to Fengtien, the remainder being for local consumption.
Fengtien (Mukden)	40,000 „	15,000 pieces sent Tientsin way, the remainder being consumed locally.
Other markets in South Manchuria	20,000 „	For the consumption of the different markets
Markets along Chinese Eastern Railway	50,000 „	30,000 pieces for local consumption and the remainder exported.
Yichow	10,000 „	Major portion exported to Chinchow.
Chaoyang	10,000 „	„
Chienchang	10,000 „	„
Chinchow	100,000 „	20% sent to Tientsin, the remainder being for local consumption.
Wutancheng	100,000 „	30% to Chihfeng, 60% to Chinchow, and 10% for local consumption.
Linhsi	30,000 „	Major portion exported to Chihfeng
Chingpeng	20,000 „	60% to Chihfeng, 25% to Chinchow, and the balance locally consumed.
Chihfeng	150,000 „	20,000 pieces locally consumed, the remainder being exported to Tientsin
Dolon Nor	80,000 „	30% to Peking and Tientsin, 20% to Kalgan, and 50% locally consumed.
Other markets	10,000 „	Consumed on the respective markets.

From the above table, the consumption on the respective markets totals 248,000 pieces and the exports to Tientsin and elsewhere 260,000 pieces, the aggregate coming up to 508,000 pieces.

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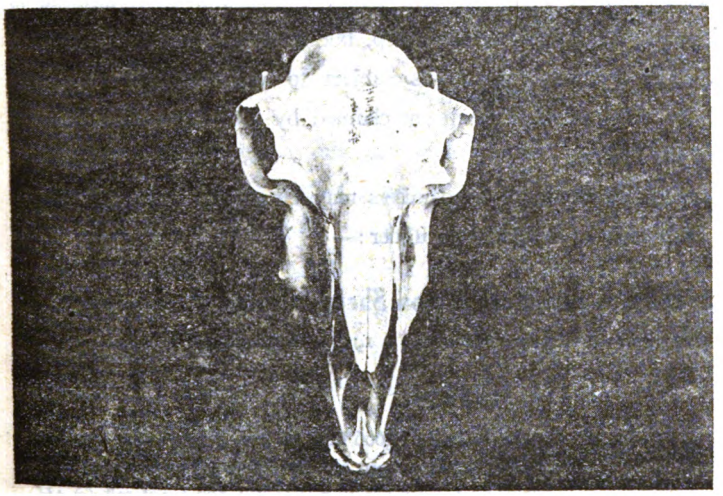
(c) Distribution Conditions and Business Methods on Different Markets.

The transportation of the skins from the producing centres is undertaken through the medium of caravans and peddlers to the extent of from 80 to 90%, the remaining 10% is carried out direct by the producers. Employees of foreign merchants and Chinese fur-dealers often go out to the producing centres to buy stock, but what falls into their hands is very meagre.

As to transactions on the market, at the principal centres, the fur-dealers carry on the business; where there are no fur-dealers, the business is put through the keepers of general stores and Chinese inns; unlike goats' skins, what is handled through the foreign firms is insignificant.

In the transaction of business in sheeps' skins, both transporters (carrying skins from the producers to the market) and consumers have to bargain with the fur-dealers, and they rarely have to pay a fee, but when the fur-dealers act as middlemen, a fee of the same amount as for wool will be charged.

As to the taxation, according to the Jehol Tax Regulations, 45 sen in large dollars per 100 pieces is levied as production tax, and according to the Fengtien Province Tax Regulations, 1½% *ad valorem*, besides a surtax equivalent to 10% of the production tax, is imposed.



SKULL OF HORNLESS SHEEP.

The season of arrival of sheeps' skins at the market varies according to the distances between the markets and the places of production,

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but the height of the season is reached when, in the Fifth, Eighth, Ninth, and Eleventh Moons by the old Chinese Calendar, the caravans return home. Skins are transported in bales of fifty to sixty pieces each.

SHEARING WOOL.

Skins are dealt in by the piece and fluctuate in price between 50 sen to S.¥1.20 in small silver coins, but such as are quoted at S.¥1 are most common.

(9) Sheep Farming.

In Eastern Part of Inner Mongolia and South Manchuria, sheep-farming is generally carried on by the owners of the sheep, but in some cases, it is entrusted to another party. The division of profits is subject to variation, but in many cases, lambs and the skins of dead sheep are claimed by the owners, and the wool and droppings by the feeders.

As already stated, the profit of sheep raisers may be gauged with the annual outputs of wool, and may be tabulated as under:—

Outlays and Receipts on Sheep-farming.

On the basis of experimental-farming in Mongolia in 1916 with 5 rams and 95 ewes.

Outlays.

Feeding	34.50	2,000 kuan (or 16,666 lbs.) of hay (enough for 100 full grown, 57 two year old, and 76 yearling sheep for thirty days) @ 1½ sen per kuan (8⅔ lb.), 100 *kin* of salt @ 4½ sen per *kin*.

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Management	120.00	One day's wages for 365 men for depasturage in addition to one day's wages for 35 men for shearing, etc. Altogether one day's wages for 400 men @ 30 sen each per day.
Sundries	2.25	
Taxes	13.60	Tax for 170 grown up sheep (the whole stock converted in calculation to grown up sheep, @ 8 sen per head.
Total	170.35	

Receipts.

Wool	¥82.50	Spring crop 250 lbs. (from 150 head of grown up and 2 year old sheep) @ 25 sen per lb. Autumn crop 100 lbs. (from 100 grown up and 16 yearling lambs) @ 20 sen per lb.
Old sheep	76.50	17 head of old rams and ewes (for exchange for 2 year old sheep) @ ¥4.50 per head.
Wethers (2 year old)	96.00	24 head of sheep @ ¥4 per head.
Sheep's skins	17.20	10 pieces of 10 dead grown up sheep @ 60 sen per piece 6 pieces of 6 dead 2 year old sheep @ 60 sen per piece 19 pieces of 19 dead yearling lambs @ 40 sen per piece
Total	272.20	

Net profit : ¥101.85.

IRON ORE OF ANSHAN AND FUTURE OF IRON & STEEL WORKS.

By Mr. K. Wada.

On Iron Ore.

Before proceeding to take up the subject of Anshan Iron Ore, a few words may be put in to the end of giving a rough idea of what iron ore is to the reader.

Iron is one of metallic elements and exists in the earth in the largest quantity next to aluminium, but unlike gold, silver, or copper, iron seldom occurs in a metallic form. In most cases, it is found in the form of a chemical composition with oxygen. What is known as iron ore belongs to a class of minerals, in which the above mentioned chemical composition mixes with other minerals and rocks, and which, within the range of iron—smelting at the present stage of scientific progress, can be utilized as material for manufacture of iron, or even has the possibility of being turned to some such material some day.

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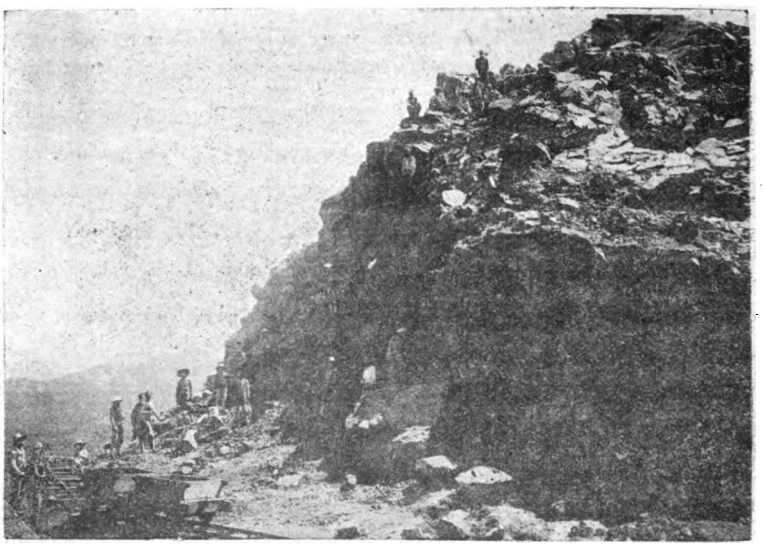

TAKUSHAN IRON MINE SECTION.

The principal minerals falling under this head include :—

Magnetite, hematite, limonite, and siderite.

Magnetite is an oxide of iron. Its iron percentage is 72.4. Hematite contains more oxygen and less iron than magnetite, the iron per centage being 70. Limonite has only 59.8% of iron. Siderite is somewhat different from the others, being a composition of oxide of iron and carbonic acid. It has the least percentage of iron, containing only 48.3% thereof.

The above instances allude to the respective minerals supposed as unadulterated with impurities. Therefore, when they contain impurities, the respective standards of iron percentages will correspondingly decrease. In other words, the quality of iron ores depends upon how much impurity they contain.

We will now look over what kinds of iron ores are being used by the chief countries in the world as material for manufacture of iron.

In Great Britain, there is an extensive siderite belt about Cleveland in the north of Yorkshire. Out of the 15,000,000 tons of annual outputs of iron ore of Great Britain, 11,000,000 tons or about 70 per cent. consists of siderite, which, on this account, occupies a very important position as iron manufacturing material of Great Britain.

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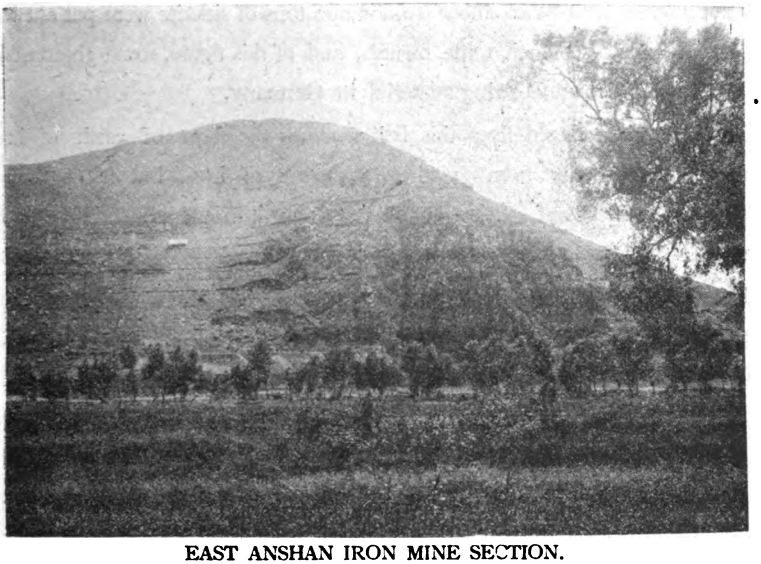
What exists about Cleveland lies under ground like a coal seam, and is mined very much after coal mining. Even in hardness, the siderite differs little from coal. The iron percentage of siderite is between 29 and 35 per cent., which may be regarded as quite meagre, but, prior to charging into the blast furnace it may be subjected to heat in a simple furnace by the use of a little fuel, in order to liberate the moisture, carbonic acid, and part of the other ingredients, and to increase the iron percentage. Moreover, as the siderite contains a suitable amount of lime, a flux,



EAST ANSHAN IRON MINE SECTION.

it is looked upon as a desirable material notwithstanding the indifferent nature of the iron contained.

Next, let us turn to Germany and France. The limonite put out from the great iron bed in Minette lying between the German-French frontier and Luxemburg constitutes an important iron manufacturing material. This iron bed is estimated to contain 3,000,000,000 tons of limonite at the ratio of 1,000,000,000 in France and 2,000,000,000 tons in Germany. Now that Alsace and Lorraine have been recovered by France, all the iron bed has become restored to France.

The following of the circumstances surrounding the conclusion of peace at the end of the European War will clearly show how hard this celebrated iron belt was contested for.

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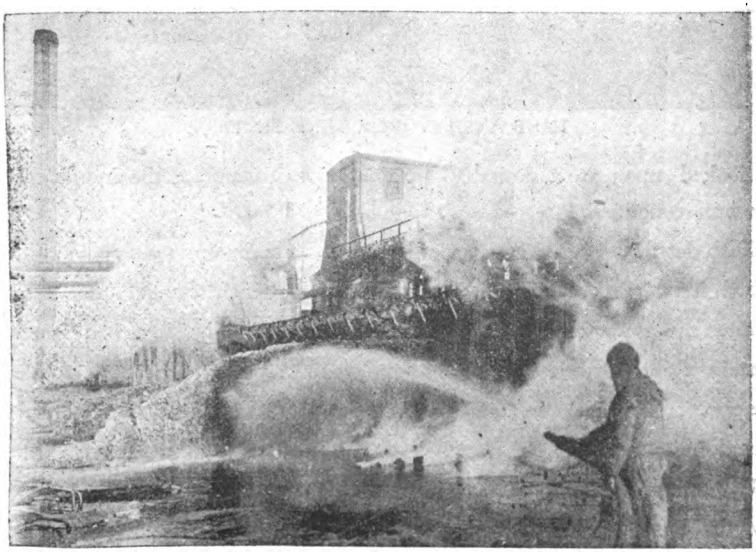
Up to the time Germany took possession of the limonite belt, what is known as the Thomas system for manufacture of steel had not yet been invented, and the siderite rich in phosphorus was made little of as iron manufacturing material. It was several years later that the invention of the Thomas system was announced, and this neglected iron belt was pushed to the fore at a bound as one of tremendous economic value. That Germany could outstrip Great Britain as an iron manufacturing country was owing to her acquisition of this extensive iron reserve.

Prior to the great War, about 40,000,000 tons of siderite were put out between the German and the French mine owners, and of this figure, some 30,000,000 tons were used as iron manufacturing material in Germany.

The siderite produced from this belt assumes the form of earth of brownish colour, containing only from 31 to 40 per cent. of iron, but it contains lime, a flux, and to this extent, its economic value as iron manufacturing material is enhanced.

Next, we shall turn to the United States that is the foremost iron producing country in the world. She is also making use of rich ore, of which iron ore forms the principal part. This ore is produced on the shores of Lake Superior. On the east,



COKE OVENS IN FULL BLAST, ANSHAN.

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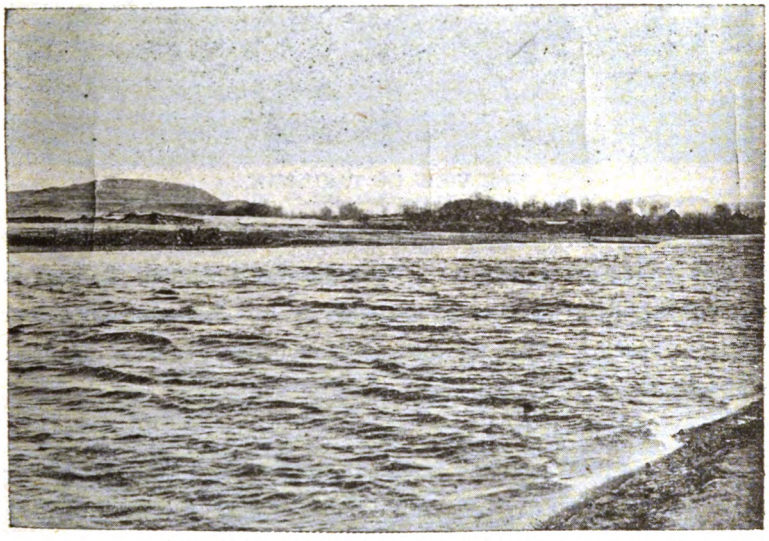
there are Marquette, Menominee, Gogebic, etc.; on the west there are Vermillion, Mesaba, Cuna, etc. Of these, Mesaba, for instance, has a mineral bed extending over 100 miles. The land is more or less undulating, but on the whole, the topographical feature is level, and the mineral bed lying from tens of feet to hundreds of feet under ground, the mining work can be carried on with extreme ease. This bed has been retained in the form of hematite (red oxide of iron) containing a large percentage of iron after part of the iron-bearing formation has had its impurity (silicious stone) solved under the erosive and oxidizing action of the subterranean water. In other words, the mineral has undergone a natural



WATER-SOURCE OF ANSHAN WATERWORKS IN THE TAITZU.

dressing process. Since the mineral has been subjected to an erosive action, it is like sands and gravel mixed with red clay. The gravel and earth overlapping this mineral are to be stripped and steam shovels are brought into use to work this mine very much on the lines of an open cut, this facilitating production in large quantities. Underground working is also carried on. The major portion of the iron manufacturing material of the United States is being supplied by this region. There are other mines having a fair producing capacity. All these ores are designated under the generic term "Lake ore."

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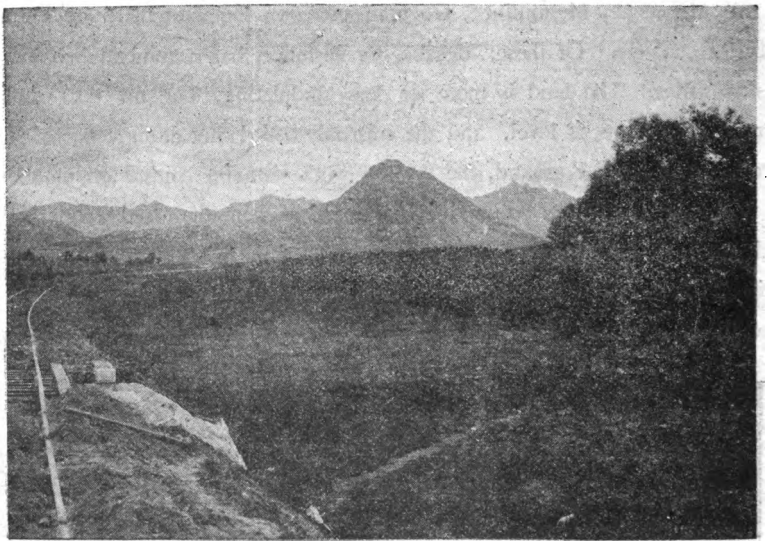

SIDE VIEW OF TAKUSHAN.

The outputs of 1919 reached 72,000,000 tons. The ore contains more than 50 per cent. of iron on an average. When the clay and sand are removed, the iron percentage will be raised to 55 to 60 per cent. The only point that may be held up as a drawback is that the place of consumption lies some distance away. From Mesaba, which is situated in the centre of this mineral bed, the ore may be sent first by railway to Duluth, a port on Lake Superior which is some 150 miles away. The ore is then transferred on board ore boats and shipped to ports on the southern shores of Lake Erie, particularly Conneaut, where it is landed to be loaded into railway cars for transportation to Pittsburg, some 150 miles off, which is the iron manufacturing centre. Thus the ore has to be carried over great distances and through a complex system of land borne and waterborne carriers. How this complexity is simplified and how superbly organized, at the same time, extensive all the loading and unloading facilities are really evoke admiration. In a word, while the ore is carried from the mine and is charged into the furnace, it is never handled by manual labour. The boat freight over the Lakes was 0.14 sen per ton per mile and the railway freight 1 sen per ton per mile, both last year.

A sketch of the chief iron manufacturing material of the three foremost iron producing countries of the world has been given above. All of them are carrying

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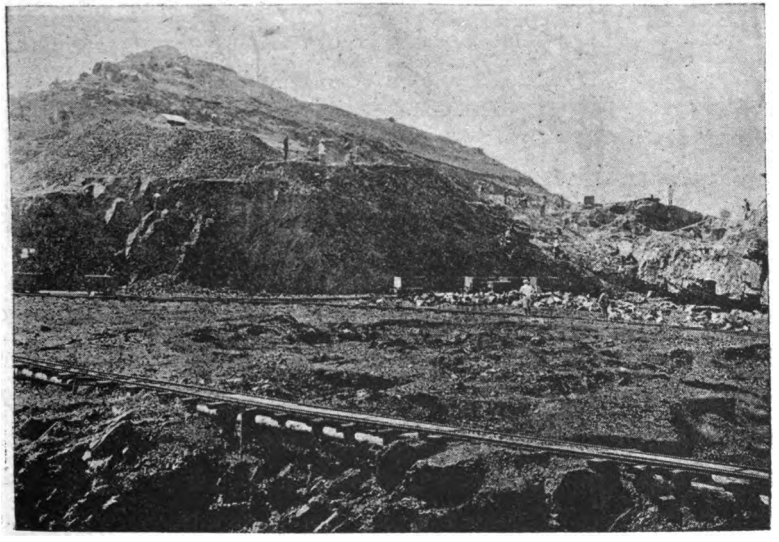
on manufacture of iron on the materials collected to convenient points. Magnetite, hematite, limonite, siderite, etc., which are considered as economically workable at all, are being utilized.

In the United States there are iron belts of fair magnitude along the Appalachian Mountains in the east, in the Adirondack Mountains in the north, and in Alabama in the south. Some of the magnetite mines yields 2,000,000 tons a year. In addition, along the coal zone in Pennsylvania, a vein of siderite runs, but this is quite outshone by the Lake ore worked on such a stupendous scale.

Great Britain, in addition to her own domestic outputs, imports magnetite, hematite, etc., from Spain, Sweden, etc. Germany, too, makes use of siderite put out in the Westphalia district, importing magnetite from Switzerland. Sweden is endowed with the richest share of iron ore, but unfortunately she is wanting in coal, and on this account, manufacture of iron remains undeveloped. Her products mainly consist of magnetite, and in the Arctic Circle in the north, there lies a magnetite mine foremost in the world known as Kirunavaara.

Its outcrop lies on a small knoll 240 metres high above the lake surface. The mineral hoard below the lake surface is put at 260,000,000 tons. One of the latest boring experiments has revealed the fact that there is a new ore bed of more



TRANSPORTING OF IRON ORE, ANSHAN.

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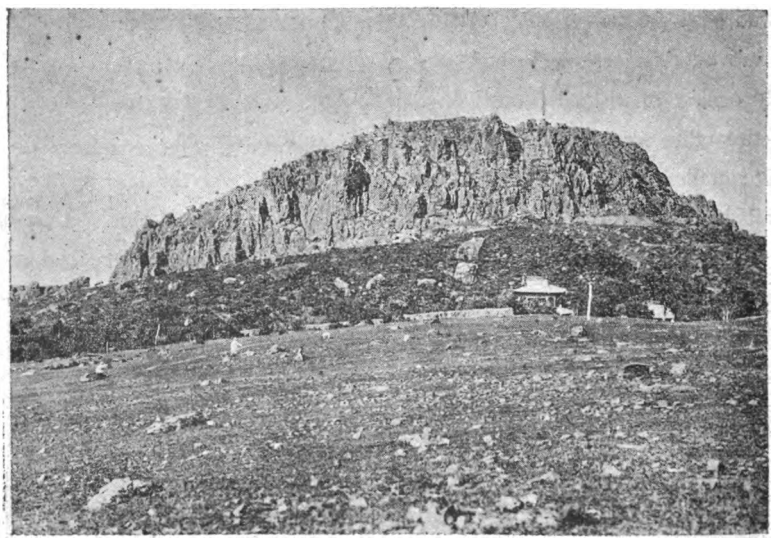
extensive scope 300 metres under ground. The mineral reserve held above 300 metres under ground is calculated at 720,000,000 tons, containing from 68 to 69% of iron. What is exported to Great Britain, Germany, etc., from this mine annually amounts to 3,000,000 tons. South of this mine, there is another iron mine known as Gellivare, which is exporting magnetite to the extent of 1,500,000 tons a year.

Anshan Iron Mine.

The iron belt of Anshan stretches to Penchihu and holds an immense quantity. The concession held by the Chenhsing Mining Co. includes a region within a radius of 7 or 8 miles with the Anzan Iron & Steel Works as the



HSIAOLINGTZU IRON MINE SECTION.

centre. There are altogether eight mining districts—one each at the east and west of Tangkangtzu Hot Springs styled Hsiaolingtzu and Tiehshihshan. South of Chienshan Railway Station with the railway track running across, there are East Anshan and West Anshan. Takushan lies on the way to the famous Chienshan Mountains. Northeast thereof, there is Kuanmenshan. Turning northward one will come across the two more mines—Wangchiaputzu and Yingtaoyuan. In the main, they fall under the head of hematite mines, but a few of them are mixed

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with magnetite. Takushan mine contains a comparatively large quantity of magnetite. The same thing may be said of the edge of Wangchiaputzu. The ore bed shows its outcrops on the top of the hill. Although the prospecting work is left unfinished, which circumstance renders an accurate estimate impossible, computed on the bases of the outcrops, the average percentage of East Anshan Mine is 27%; that of West Anshan 30%; that of Takushan 37%; that of Yingtaoyuan 28%; and the others are very much the same. The past experience in mining and prospecting indicates the presence of rich ore in each mine, and if operated on a picking principle, an ore of from 40% on an average or even of 60% on an average is obtainable. Up to this date, the picking plan has been pursued in order to supply material to the Anshan Iron & Steel Works. However, rich ore exists irregularly, and is found scattered all over the district in quantities of widely varying range. Accordingly there is no depending on the sureness of supply, for the supply may be exhausted to-morrow. Above all, the rich ore occurs only in a limited amount, as may be easily imagined. Still, the poor ore as above enumerated is hardly suitable as material for the blast furnace. Especially the iron ore of Anshan is generally compact and its particles are very fine. Moreover, almost the whole of the impurity is made up of silicious

IRON ORE MINED.

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stone which impedes the smelting process. This state of things would seem to put a very pessimistic complexion on the utility of the Anshan iron mine. However, it holds iron to the amount of over 100,000,000 tons, and this great treasury of nature must be opened somehow. The key to a like treasure house has already been found in the West. Poor ore of a similar quality may be subjected to a mechanical handling to get its impurities to be removed so as to make an artificial rich ore.

Ore-Concentration and Briquetting of Anshan Iron Ore.

The iron ore of Anshan is required, prior to being ready as iron manufacturing material, to have its economic value improved by a dressing process. The dressing of iron ore has been developed these twenty years and is in vogue at many places in the West. The method varies according to the nature of the ores. With magnetite, its strong magnetic quality is availed of and what is called magnetic dressing is adopted. Then, with hematite and others, dressing by specific gravity is applied. What is now in most popular use is the dressing of poor magnetite ore. The dressing of hematite is found in the instance of the special class of ore occurring in the Mesaba belt, Minnesota, and outside this, it is conducted supplementarily to the magnetic dressing method.

The Anshan ore, as already stated, is composed mainly of hematite, and only part of Takushan and Wangchiaputzu mines contains magnetite. As to the Takushan ore, from both experimental tests and actual examples in foreign countries, it may be effectively handled by applying some dressing device adapted thereto, but as regards the hematite which makes up most of the ore, there is no foreign example to serve as guide. Nor has this subject been exhaustively studied.

However, three methods may be suggested, that is, (1) Dressing by specific gravity, (2) Magnetic separation, and (3) Magnetic separation after the hematite has been reduced into magnetite.

What is considered as the most promising at present is (3). The results reaped from experimenting upon this method in Sweden were exceedingly satisfactory, but for applying it to practice as a business venture, further study is

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required. The second method is also promising, but the need of large capital is its chief drawback. The first method is unsuited to the Anshan ore. Thus the question of dressing hematite which takes up the large portion of the Anshan ore can hardly be regarded as solved, although its solution seems only a question of time, once the method therefor has been decided upon.

The ore-dressing must be accompanied with briquetting. Ore-concentration is, in most cases, conducted by crushing the ore into a pulverized state, and for this reason, the refined ore obtainable by ore-concentration is found in the form of powder, which is unsuited to be charged into the blast furnace. It must be converted into briquets. There are two ways of making briquets. One is by the use of heat; the other is by the use of a cementing material. The former method is the more popular and has three different processes. One is nodulizing; the second is sintering; and the third is briquetting. In the nodulizing process, something like a revolving furnace used at a cement factory is used to make dust ore into briquets. In the sintering process, the rich dust ore is put in the roasting furnace, mixed with pulverized coal, coke, charcoal, etc. This mixture is then ignited and, by means of ventilation, the pulverized fuel mixed with the dust ore catches on fire and changes the dust ore into briquets. By briquetting is meant to make dust ore into the form of brick by mechanical appliances and to bake it in the furnace.

The above three methods have their own advantages and disadvantages, but sintering is believed to be the most advanced method. All the three methods are in vogue in many countries, and the only thing to be done is to choose what is believed to be the best.

Future of Anzan Iron and Steel Works.

The Anzan Iron & Steel Works was originally planned to put out 1,000,000 tons of steel a year. In the wake of the completion of the first part of the programme, the second and third parts of the some programme were to have been executed. But owing to sundry circumstances, the extension work lies practically suspended. For instance, the two blast furnaces have already been completed, but the steel works that ought to be attached to them has no immediate prospect

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of being brought into existence. What should be done with the Anzan Iron and Steel Works is a serious and interesting question which deserves careful study from divers points of view.

Apart from such practical question, we shall speculate upon the future of the Iron and Steel Works on the bases of the fundamental conditions of its establishment, that is, the supply of raw materials, the markets for the products, etc.

The raw materials are iron ore, cokes, lime stone, etc.

As to iron ore, by the application to magnetite of Takushan of the ore-concentration and briquetting methods for magnetite which have been so happily and economically solved in the West, an artificial rich ore containing more than 60% of iron, which is decidedly advantageous, may be obtained.

APARTMENT HOUSE, ANZAN IRON & STEEL WORKS.

Supposing that this artificial rich ore be supplied to the two blast furnaces, a roughly estimated consumption amounts to 350,000 tons. From the estimated ore reserve of Takushan Mine, it may have sufficient to last about thirty years.

If the mixture of 66% of the artificial rich ore and 33% of natural ore containing 40% of iron should be used as raw material to be charged into the blast furnaces, the above mentioned period may be extended to about fifty years.

However, the Anzan Iron and Steel Works should not be satisfied with the production of from 150,000 to 200,000 tons a year. By raising the annual outputs to 500,000 tons, nay even up to 1,000,000 tons, the Works may well be regarded as worth founding.

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When such possibilities are considered, the exploitation of Takushan Mine alone will not do. The utilization of the major portion of hematite as raw material by all means would be absolutely necessary for the annual production of 500,000 tons to 1,000,000 tons a year.

It is on this account that the problem of the briquetting of hematite assumes a most significant complexion. It is regrettable to say that, with hematite produced at Anshan, no tangible instance of a satisfactorily economical solution has yet been known, nor has the study of the same subject advanced, and therefore it can hardly he said conclusively that it permits of conversion into an artificial rich ore as advantageous as the one to be made from magnetite.

Still, what may be done in order to attain this object seems predetermined and it is considered to be quite practicable. For this reason, a proper or adequate study of this problem should be prosecuted and, we are made bold to believe that little stands in the way of getting ready the sufficient raw material for the manufacture of 1,000,000 tons of pig iron a year at some future date.

Cokes are made from coal by dry distillation. The coal may be composed chiefly of Fushun Coal mixed with suitable amounts of Penchihu or Kaiping Coal, and the mixture will put out a coke highly suited to the use of an iron and steel works.

We may speak with confidence from the coal reserves of these Collieries that their supply will prove quite adequate.

Limestone is in less demand than the ore and cokes, and the district, in which the new Works stands, abounds in limestone.

As above stated, there is no reason to fear the shortage of the principal raw materials for the Iron & Steel Works. Seen from its relation to the raw materials only, the Anzan Iron & Steel Works stands in a more favourable position than any of its likes in Japan. Moreover, the very fact of its being located in the midst of the iron ore belt, an efficient raw material may be obtained at a comparatively moderate rate even if some outlay may be required for the ore-concentration. Even now, the iron ore is supplied on very moderate terms. The cost of the iron ore does not amount to 20% of the production cost of pig iron per ton. Cokes cost dear nowadays, taking up about 40% of the production cost. This is owing chiefly to the high price of coal. In the iron

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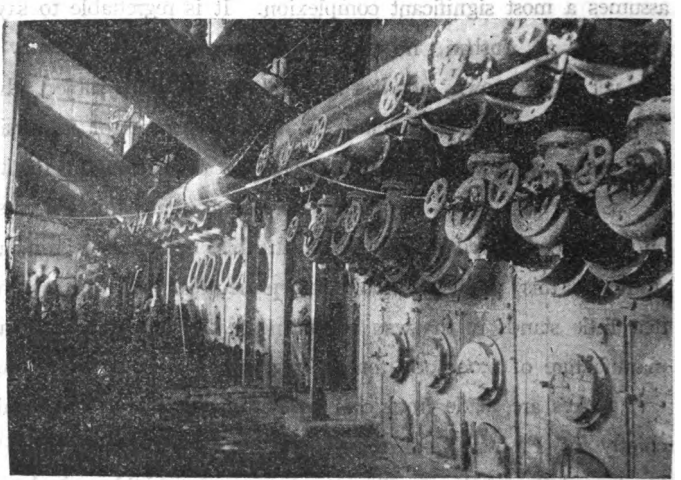
and steel manufacturing industry, coal forms an important factor having a serious bearing upon the production cost. Consequently, its supply on low terms is essential, and at the same time it must be used in the most effective manner. The quality of an ore is closely related to the quantity of coke to be charged into the blast furnace.

To return, the collieries supplying coal, the primary raw material can not be said to lie at great distances. Furthermore, these collieries being closely related to the management of the Iron & Steel Works, there are ample facilities available.



BOILER ROOM, ANZAN IRON & STEEL WORKS.

The most convenient market for the product is Japan, as may be seen obviously. Supposing that a Steel Works turning out 1,000,000 tons of pig iron a year should exist to-day, the Japanese market can easily digest the annual product. The only question to be considered is the competition with the foreign imports. However, from the point of distance only, the Anshan products are at an advantage, compared with the foreign imports. If the cost of production should not be much dearer, the Anshan manufacture would have fair chances to come out of the competition favourably. But, the present day ability of the Japanese is feared to fall short of directing and manipulating this complex and gigantic enterprise. Furthermore, they are lacking in experience. Naturally, the producing cost will be raised, making the Anshan product placed awkwardly in competing with the foreign imports. Such a state of things cannot be regretted too much. But, it would be too much to expect an easy success by aping the intricate industries of the West, in which

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the technical geniuses and talents have concentrated their energies on the invention and improvement of these industries, raising them to what they are to-day by paying dear sacrifices and by turning to most account the experiences and discipline acquired by efforts of over a hundred years.

Moreover, under the import tariff now obtaining, it might be likened to a mere boy running a race with a grown up athlete. It could hardly be a race.

The steel manufacturing countries like Great Britain, the United States, Germany, etc., adopted a liberal protective policy for steel manufacture at its early stages, and if Japan wishes to foster the same industry, she ought to follow the example. From this point of view, the question of the market for the products of the Anzan Iron & Steel Works may find a solution.

As stated above, the Anzan Iron & Steel Works has little to concern itself about as to either the supply of the necessary raw materials or the market for the manufactures; it is also feasible for the Works to put out 1,000,000 tons pig iron a year some day. However, as to the practical questions what should be done with the Works and what will become thereof, they remain riddles that will be solved by time only.

TANNING INDUSTRY IN MONGOLIA.

By Mr. T. Kamura.

There is only one way of tanning hides known to the Mongolians. It is by means of cow's milk. This method was in vogue among the primitive races. Besides, sheep's skins and calves' hides only are tanned by the natives of Eastern Mongolia, as they are. No other hides or skins are treated similarly, but they are merely dried and exposed, the leather required for the making of the natives' own shoes and for other uses being bought of Chinese dealers.

This method of tanning by means of milk varies according to places. The simplest one is in use about Wuchumuchin and Koshihkoteng and at the west of the Hingan Range. In the east, about Talaihan on the Manchurian frontier, the Chinese method of using sodium sulphate as well as milk is followed by some people.

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The different ways of tanning in various parts of Eastern Mongolia are roughly sketched under :—

1. In West Wuchumuchin.

Dried hides and skins are soaked in a large jar containing a mixture of five pails (1 pail corresponding to 3 *sho* by the Japanese measure) of water and four pails of sour milk. In four or five days, a large bowlful (about two Chinese kin) of table salt is put, and the contents are allowed to stand about a dozen days. Then the hides and skins are taken out to dry. Next, moist earth is put on the inside, and when the hides and skins have become soft, what is put on the inside is scraped off.

In this district, all furs and skins used for clothing are usually smoke-cured and turned to brown. The curing process is effected as under :—

Three stricks of similar lengths are tied near one end and are stood on the other ends. A hide or skin, after being tanned, is hung over one side of the sticks, with the hairy side on the outside. Fire is built of animals' dung, especially horses' droppings, underneath the hide or skin. A little earth is put on the fire so as to make it smoky. The hide or skin is thus treated for a full day and is then left in the water for a couple of days, to be taken out and dried, then to be crumpled together and rendered soft. The tanning season runs for the three months of the Seventh, Eighth, and Ninth Moons by the old Chinese Calendar.

2. In Koshihkoteng Principality.

Sour milk (exclusive of the coagulated albumen) is rubbed on the inside of a dried hide or skin, then it is folded with the hairless side on the inside. In summer months, this rubbing process is repeated two or three times in the course of ten days. In autumn, over a dozen days are wanted. After the rubbing process has been repeated for the third time, the hide or skin is scraped with a primitive instrument as reproduced elsewhere, and this puts on the finishing touch. The tanning season lasts from the Fourth to the Ninth Moon by the old Chinese Calendar.

Curing by smoke is not practiced in this region.

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The only treatment, to which the skins are subjected, is to put on moistened earth and to rub it off when quite dry. This will only cause the skins to contract.

3. In Palin Principality.

Dried skins, if found unclean, are washed in the river, and then are put in a large jar. The clean dry skins are put in a jar or a wooden tank. This jar or wooden tank is filled with sour milk beforehand and for every ten pieces of sheep skins, three or four bowls of table salt are put in. When the sour milk contains more water than sufficient, roasted millet, pulverized, is mixed with the sour milk.

The skins are left in the jar or tank for six or seven days. Then they are taken out to dry in the shade for four or five days (at night, they are put on mats in the open air. After being thoroughly dried, moistened earth is put over the insides of the skins and then the insides are scraped with the same primitive instrument as above mentioned, to be rendered soft.

The above tanning method is practiced during the Fifth, Sixth, and Seventh Moons by the old Chinese Calendar, and not any later in the season.

4. In Powang Principality.

In Powang Principality, too, sour milk is used for tanning purposes, but, in absence of sour milk, millet is cracked and then fermented to be used as a substitute. Sour milk is more conducive to render the skins soft, and therefore it is in more popular use.

The sour milk is prepared in the following fashion:—

6 Chinese kin of sour milk for every ten sheep skins, and it is mixed with 3 or 4 Chinese kin of millet brans and 1 Chinese kin of table salt.

When millet is used as a substitute for sour milk, 4 Chinese *sho* of cracked millet is mixed with 1 Chinese kin of table salt, and 6 Chinese *kin* of warm water. This mixture is put in a pan to be boiled, and then it is transferred to a jar which is then placed on the *kang* (the earthen floor underneath which the hot air from the Chinese stove is led) to be kept there for a few days so that the mixture may ferment.

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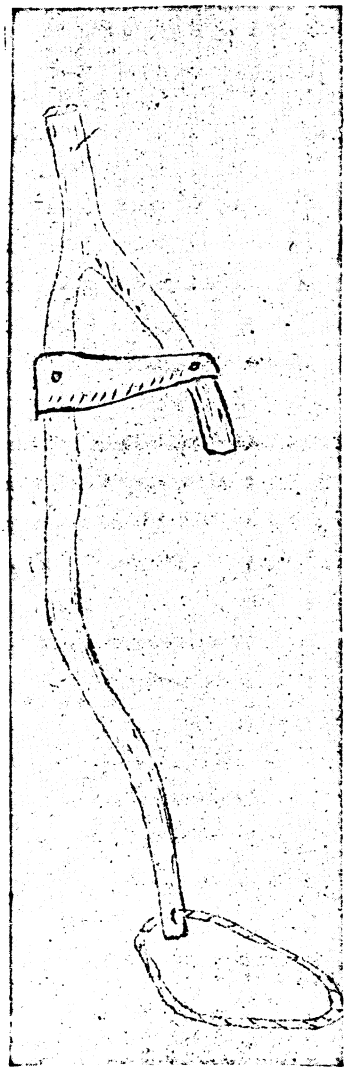

SKIN-SCRAPER.

The wooden part is made of elm. The horizontal metallic part is made of an old scythe. The rope at the bottom is about a foot and ten inches long.

The skin which is to be scraped is hung over the stick. The party using this should step on the rope and hold in hand the upper handle of the scraper and should scrape the skin with the scythe-blade.

Both mixtures above described assume a semi-solid form and can hardly be called a liquid.

The tanning process is conducted in the following manner:—

Dried sheep skins are spread, the insides are wetted with water so as to be made soft, then either sour milk or the paste-like substitute is put on them; the skins are then spread on the kang and the paste-like mixture is applied once every one or two days. In ten days' time in cold weather and in four or five days in warm weather, the hair or wool may be easily pulled off. The skins are then hung over wooden sticks to get dry in the shade. They are taken off dry in four or five days' time. Then, the insides are moistened with water and are subjected to the scraping operation by means of the same instrument as mentioned above.

5. In Talaihan Principality.

Tanning of hides and skins in Talaihan Principality is taken up chiefly in May and October. For every ten sheep skins, three or four Chinese sho of sour milk is mixed with one bowl of sodium sulphate, two or three bowls of table salt, and three or four bowls of roasted millet bran, and the skins are put in this mixture dry, to be kept therein for about from eight to ten days. Then they are taken out and dried either in the sun or in the shade. Next, water is sprayed over the insides of the skins to be made soft, and

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lastly they are scraped according to the above mentioned process. Whether or not the tanning process has been completed may be ascertained by pulling at the wool. If the wool comes off, the tanning has been well done. It is said that, without the use of sodium sulphate, the skins are found harder.

6. In Tushihyehtu Principality.

The tanning mixture is prepared of 6 Chinese sho of sour milk and five bowls of table salt for every ten pieces of sheep skins. Dry skins are kept in the mixture for eight or nine days (seven or eight days in the Fifth and Sixth Moons by the old Chinese Calendar), during which period the skins are turned over twice or three times a day. The oftener are they turned over, the better results are obtained. Whether or not the tanning process is well over is said to be judged by the smell. Then, the skins are hung over ropes interwoven, with the hairy side exposed to the sun. When dry, the skins are laid on the moist ground, with the insides in contact with the ground, and when they have got softened, they are put through the same scraping operation.

From the above it may be inferred that in all cases, the chief ingredients for the tanning mixture are composed of sour milk and, in many cases, table salt.

In the west of the Hingan Range and in the district at its western foot, the tanning process is very simple, and as it nears the Manchurian frontier, it becomes more complex, as may be seen from the above. That cracked millet is mixed with the sour milk in both Poshan and Talaihan Principalities and pulverized millet is put in the tanning mixture in Palin Principality may appear at the first glance to be for hardening the mixture so as to make it more paste-like, but it will be easy to understand that it is intended at the same time to help the lactic acid to ferment.

Now, we shall enlarge on what the sour milk is that constitutes the chief tanning factor. It is called "airg" in Mongolian. It is made of sour milk warmed up and coagulated. Then the uppermost fluid or wheg is taken off. Into this wheg is put fresh milk to the amount of about one-third, and then this mixture is put in a covered vessel to get fermented again. Since much lactose is contained in this mixture, it will be easy to imagine that a strong fermenting

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process will take place. What is used most popularly consists of the liquid *minus* the *alji* which lies precipitated at the bottom. In this liquid is contained much lactic acid, fat, and lactose which has not been fermented completely, and albumen dissolved in the water. The compositions that chiefly figure in the tanning process are fat and lactic acid. It may be added that tanning by means of fat or oil has been practiced in many parts of the world from time immemorial.

The principles of tanning by fatty substances are that the fatty substance finds its way into the tissues of the skin, part of which becomes detached into an insoluble oxidized matter. This oxide acts upon the skin to impart thereto a water-proof character. Again, part of the fatty substance gets oxidized and turns into a resinous substance, which, covering every tissue of the skin, renders it soft. These two new qualities combine in making a leather which will not harden even after the skin gets dry.

When the sour milk or airg is applied to the skin, the lactic acid therein will act upon the skin tissues and will expand and soften them, facilitating the penetration of the fatty substance into the tissues. But what really effects the process is believed to be the fatty substance in the milk.

As already stated, the pulverized or cracked millet mixed with the sour milk is for the dual purpose of rendering the mixture paste-like and facilitating the fermenting process to make lactic acid, the albumen of which being absorbed into the skin tissues. In Poshan Principality, cracked millet is used in place of sour milk when the letter is not obtainable. In such case, it is easy to see that the production of much lactic acid and other kinds of micro-organisms will expand and soften the skin tissues, but what actually accomplishes the tanning action remains to be found by further investigation.

The mixing of sour milk with sodium sulphate, as is in vogue in Talaihan district, may be regarded as more advanced than the other methods enumerated above. The use of sodium sulphate in tanning process has been in popular practice in China. It is much like the Japanese way of tanning by means of alum, and produces a whitish soft leather, which, however, is not sufficiently impervious to water. If the leather is soaked in water, the sodium sulphate will become dissolved and the leather will be restored to the original state of a skin.

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The same thing may be said of the Japanese way of tanning by alum.

When sour milk alone forms the principal tanning agent, the leather becomes water-proof, but partakes of a yellowish colour. Moreover, as the removal of the surplus fatty substance is incomplete, the leather feels somewhat moist and is not very tender, either. However, when sodium sulphate is mixed together with sour milk, the product acquires a whitish hue, is soft, and is, at the same time, water-proof.

The tanning methods in the Eastern part of Inner Mongolia are roughly as stated above. It is a pity that the investigations by the author of this article happened to be conducted in winter and he had no opportunity to see for himself any tanning process carried on.

This circumstance naturally must have tended to leave out something useful in the present article, although unwittingly. The exact extent of fermentation, the temperature, the exact quantities of the mixing ingredients of the tanning preparations, etc., may be given upon further investigations.

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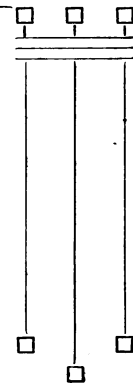

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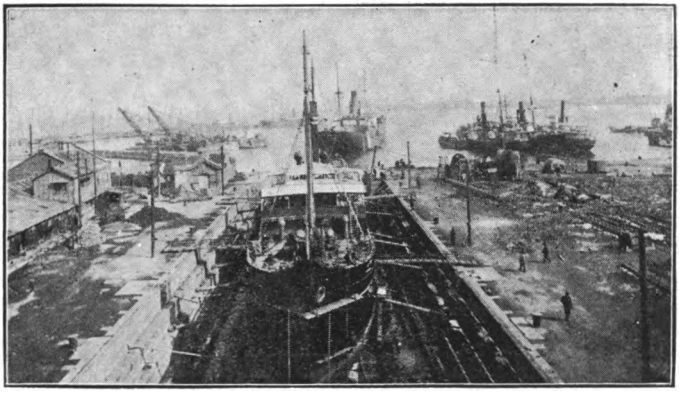

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Reserve Fund . . . . . ¥ 50,000,000

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THE
LIGHT OF MANCHURIA

TRADE CONDITIONS OF PORT OF DAIREN.

For 1920.

With Comparative Table of Trade Returns for Five Years.

By Mr. K. Hakamada.

From January to December, 1920, the total imports to the port of Dairen amounted to 974,215 tons, and the total exports 3,064,636 tons, giving an aggregate of 4,038,851 tons. Compared with the highest record since the opening of the port of Dairen, which was attained in 1919, a decrease by 436,404 tons in imports is noted, whilst in exports an increase by 251,480 tons is shown, the net decrease amounting to 184,924 tons.

The trade of Dairen, which had kept rising at a wonderful speed, met a check in 1920 because of the universal economic shock which followed the termination

THIRD WHARF WHARF "B"

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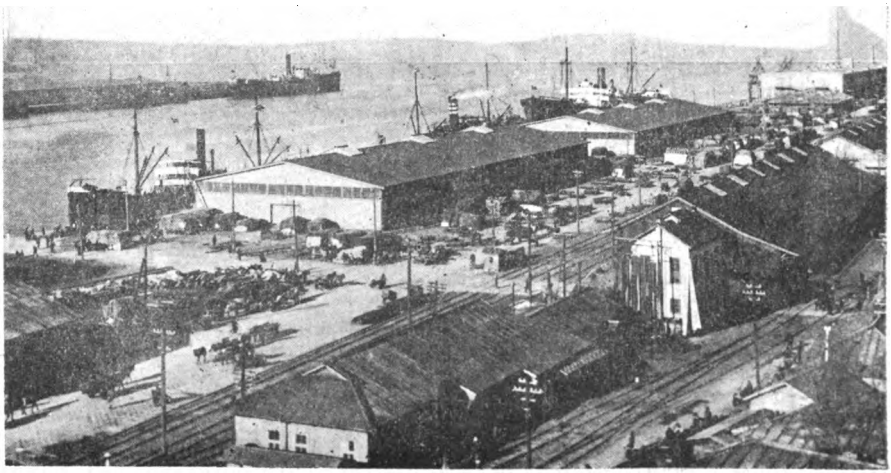
of the great War. This much is, indeed, true, but it is notable that the export of Manchurian staple produce recorded an increase.

For reference sake, the tonnages of imports and exports for the port of Dairen since 1908 are tabulated under :—

	Imports tons	Exports tons	Total tons		Imports tons	Exports tons	Total tons
1908	336,927	440,839	777,766	1915	537,230	1,732,806	2,270,036
1909	249,627	1,021,219	1,270,846	1916	599,921	1,731,524	2,331,446
1910	368,670	922,415	1,291,085	1917	833,268	2,155,588	3,988,856
1911	415,678	992,083	1,407,761	1918	956,545	2,491,154	3,447,699
1912	463,830	1,093,490	1,557,320	1919	1,410,619	2,813,156	4,223,775
1913	520,139	1,585,846	2,105,985	1920	974,215	3,064,636	4,038,851
1914	505,774	1,598,816	2,104,590				

The above table shows how steadily the trade continued to grow uninterruptedly from the beginning until a break occurred in 1920. However, it is consoling to observe how aloof the export business seems to stand from the general business depression. This may be put down to the fact that the essential parts of the exports consist of commodities of world-wide demand, such as Beans and Bean Oil.



SECOND WHARF

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It may be remarked that the abrupt increase in the volume of trade since 1918 should be ascribed in a large measure to the closing of Vladivostok to trade, owing to the historic revolution in Russia. Upon the fall of the Romanoffs and the separate peace being concluded by Soviet Russia with Germany and Austria in 1917, the Allied Powers caused China to close the Russo-Chinese frontiers to trade and stopped any goods carried by the Chinese Eastern Railway from being forwarded to Russian territory. In consequence, the port of Vladivostok fell into a condition as bad as closed. As a result, the produce of North Manchuria had to find an outlet through South Manchuria. Hence the remarkable increment.

How soon order will be restored in all Russia is a question, to which time alone can answer. However, at least the economic reconstruction of Siberia seems likely to be realized sooner or later. The bare fact that British and American capital and talent will be invested in Siberia, if reports to such effect, that are repeatedly circulated, should be true, may be accepted as a sign that some Britishers and Americans who are level-headed businessmen are looking forward to the restoration of order in Siberia in no distant future. Once the economic reconstruction of

WHARF "A" MAIN THOROUGHFARE

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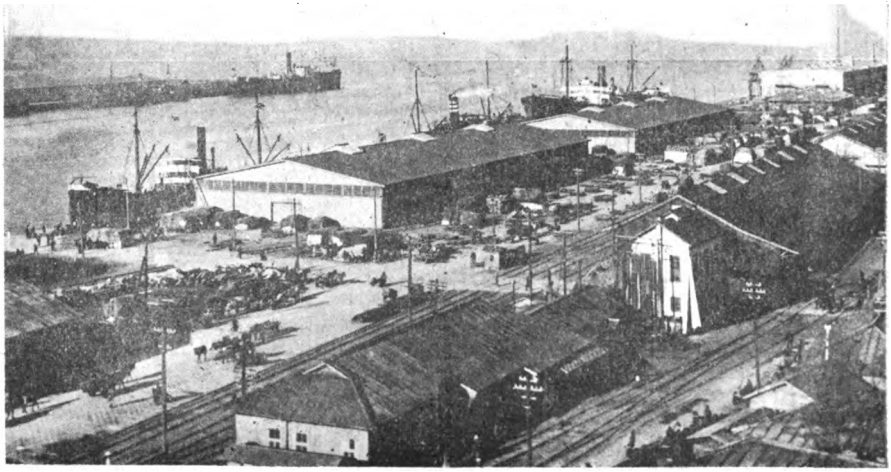

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Siberia is realized, the revival of both the Chinese Eastern Railway and the port of Vladivostok will prove remarkable, and its effect is sure to be felt by Dairen most.

Before proceeding to enlarge upon the contents of the imports and exports for 1920, we shall see what ports and countries figured most prominently in the trade with Dairen.

A. IMPORTS.

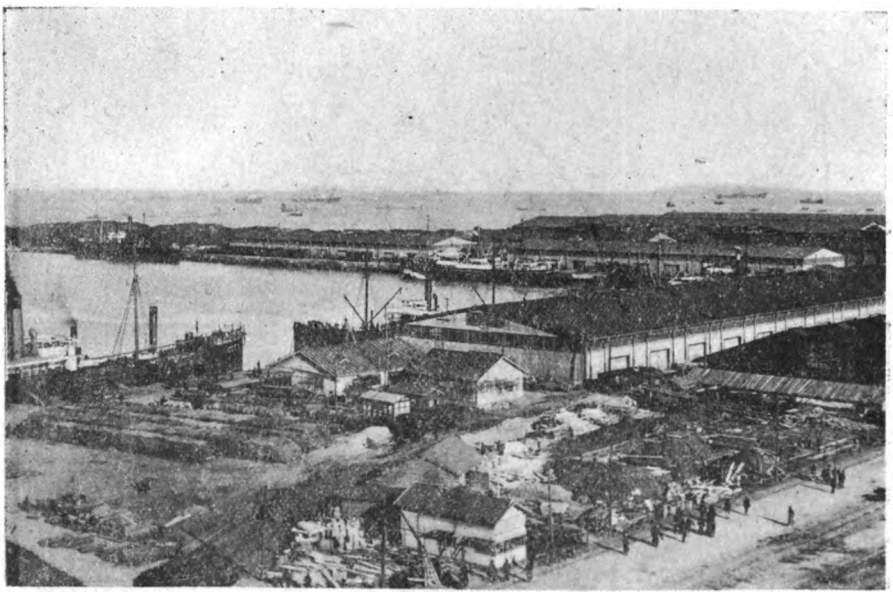
Ports of Shipment.

JAPAN.

	Tons	Per cent
Wakamatsu	136,441	23
Kobe	123,590	21
Osaka	105,678	18
Shimonoseki & Moji ...	69,413	12
Yokohama	31,492	5
Kushiro	30,619	5
Misumi	19,733	3
Elsewhere	71,553	12
Total	558,519	100

CHINA.

	Tons	Per cent
Shanghai	120,424	44
Chinwangtao	55,720	20
Tientsin	35,504	13
Tsingtao...	22,240	8
Hongkong	18,557	7
Elsewhere	22,285	8
Total	274,730	100



COAL DEPOT FIRST WHARF

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CHOSEN (Korea).

Chemulpo	13,512	59
Fusan	9,471	41
Total	22,983	100

SOUTH SEAS.

Sourabaya	3,493	88
Elsewhere	485	12
Total	3,978	92

EUROPE.

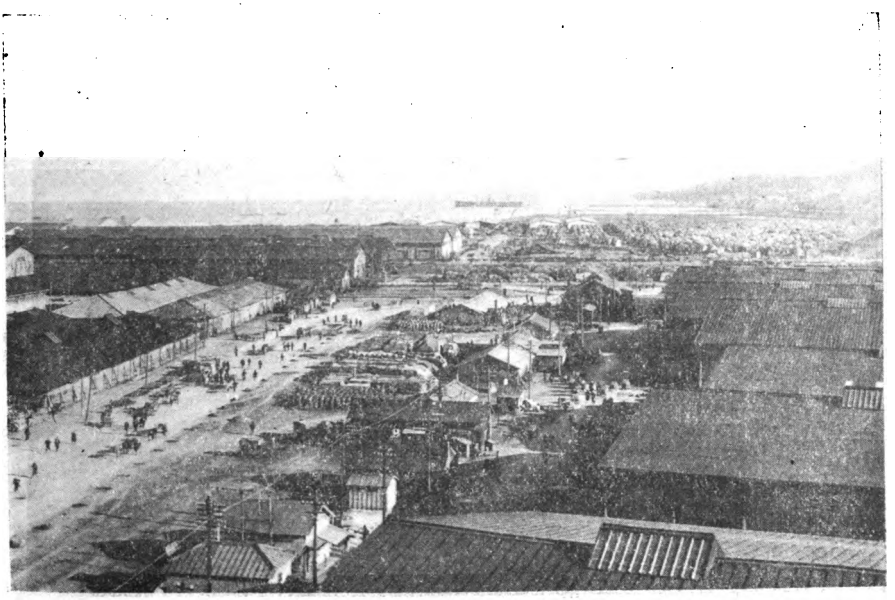
Liverpool	4,964	71
Glasgow...	1,999	17
Elsewhere	877	12
Total	7,840	100

UNITED STATES.

New York	24,764	32
Portland...	21,584	28
Seattle	17,493	23
Elsewhere	13,169	17
Total	77,010	100

Of the total imports of 974,215 tons, the respective percentages of the principal countries of shipment were a little over 60% for Japan, a little over 20% for Chosen, 28% for China, 0.4% for the South Seas, 0.7% for Europe, and 8% for the United States; or 91.4% for the Orient and the remaining 8.6% for Europe and the United States.

In addition, 1,164 head of live cattle, 26 mules, and 70 birds, besides ¥7,178,800 in hard money, were imported.



GOODS SHEDS AND STORING GROUND

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Exports.

Ports of Destination.

JAPAN.

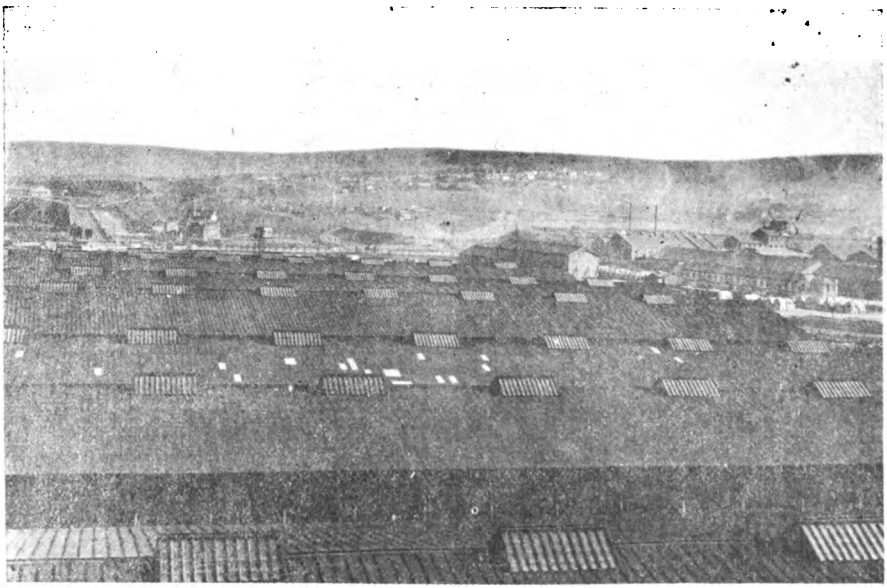
	Tons	Per cent
Kobe	595,587	32
Yokohama	504,766	27
Shimonoseki & Moji ...	114,948	6
Taketoyo	106,588	6
Nagoya	99,762	6
Takao	98,205	5
Shimizu	73,975	5
Osaka	61,879	4
Nagasaki	56,034	3
Keelung	51,334	3
Yokkaichi	20,507	1
Elsewhere	89,834	5
Total	1,873,419	100

CHOSEN.

	Tons	Per cent
Chemulpo	58,892	64
Fusan	19,559	21
Elsewhere	13,782	15
Total	92,233	100

CHINA.

Shanghai	130,786	—
Tientsin	62,282	—
Chefoo	46,003	—
Amoy	43,833	—
Canton	40,012	—
Hongkong	33,902	—
Tsingtao...	26,781	—
Elsewhere	34,326	—
Total	417,925	—



GOODS SHEDS

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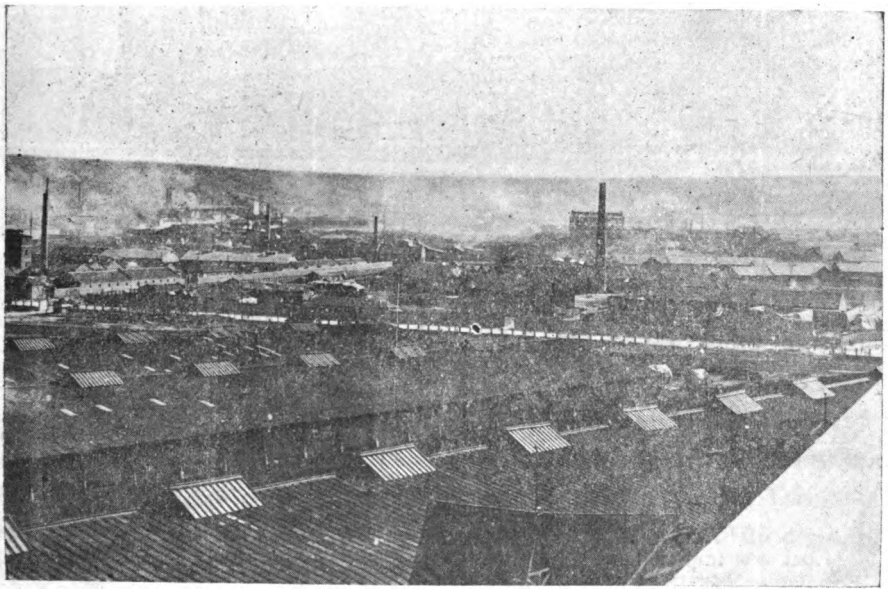
EUROPE.			SOUTH SEAS.		
Po t Said	295,740	56	Sourabaya	32,711	55
Copenhagen	66,142	13	Elsewhere	26,600	44
Rotterdam	65,213	12			
London	31,099	6	Total	59,311	99
Elsewhere	66,498	13			
Total	524,692	100			

UNITED STATES.			FAR EASTERN RUSSIA.		
Seattle	73,975	—	Alexandrovsk	4,490	—
Elsewhere	16,872	—	Vladivostok	1,713	—
Total	90,747	—	Total	6,203	—

The percentages for the different countries of destination were a little over 60% for Japan, 3% for Chosen, a little less than 14% for China, 0.2% for Far Eastern Russia, 1.9% for the South Seas, 17% for Europe, and 3% for the United States. Thus the total exports of 3,064,636 tons were divided between the Orient and the West (Europe and the United States) at 80% and 20% respectively.

Besides, 3,004 head of cattle, 195,428 tons of bunkers, and ¥10,554,205 in currency were exported.



BEAN MILLS GOODS SHEDS.

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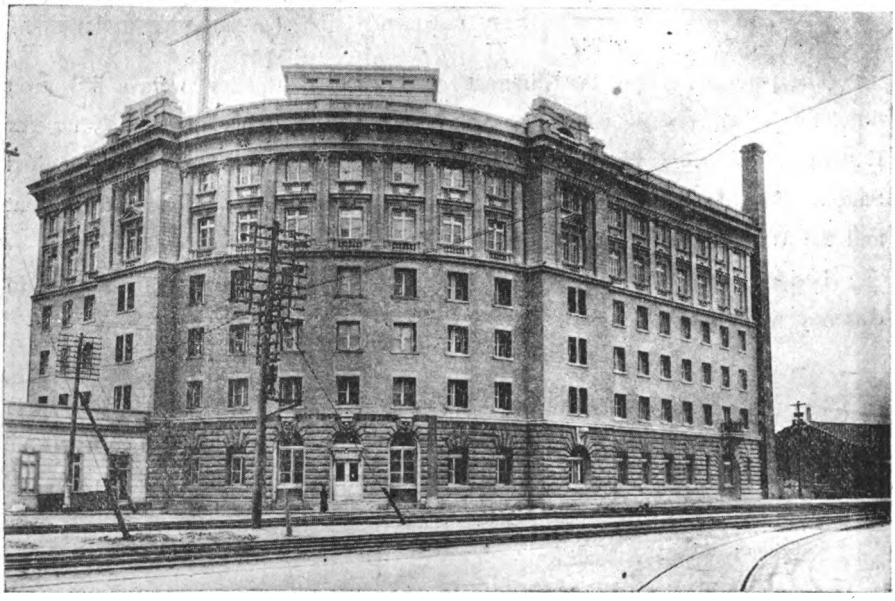
(A) Imports.

The goods imported to Dairen in 1920 consisted of more than sixty kinds, and places of distribution included, in addition to the Kwantung Leased Territory, the South Manchuria Railway Area, all other parts of South Manchuria and the district about Harbin.

The chief imports were iron and steel ware, gunny bags, tobacco, cement and lime, rice, vegetables and fruits, railway sleepers, empty tins and barrels, fish



NEW RAILWAY WHARF OFFICE, DAIREN.

and other marine products, machinery, general instruments, coal, kerosene oil, wheat flour, oils, provisions, cotton yarn and cloth and fabrics, sugar, liquors, paper, etc.

Each article of the principal imports will be briefly dwelt upon, appended with a table for the past five years.

Coal.

Coal was imported to Dairen for the first time in 1917, the fresh industrial enterprises which sprang up all over North and South Manchuria during the Great

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War increased the demand for coal to such an extent that the supply of Fushun Coal alone fell far short of the requirements. Kaiping Coal was the first to be imported. From 1918, Japanese coals were brought in. In the middle of March, 1920, the terrible economic shock seized Manchuria like the rest of the world and caused all kinds of business ventures in Manchuria to wither or to be undermined. In consequence, demands fell off sharply; this created an excess in supply and resulted in an abrupt decline of coal prices. However, the outstanding contracts for Kaiping and Japanese coals could not be cancelled, and during the fiscal year 1920 their import was kept up. Consequently, the coal stocks at the Fushun Collieries and at the coal yards along the S. M. Railway Lines kept increasing steadily, and finally some restrictions had to be placed on the daily outputs at the Collieries.

Imported Coals, and their Kinds and Quantities.

	Japanese tons.	Chinese tons.	Total tons.
1916	448	284	733
1917	1,507	17,395	18,920
1918	2,322	92,206	94,528
1919	72,373	166,674	259,047
1920	150,347	53,590	203,937

Remarks: Japanese coals consisted of Kyushu Coals, and the port of Wakamatsu, close to the Edamitsu Steel Works, sent 95%, the remainder being divided between Karatsu and Hakata.

Chinese coals included Kaiping (on the Peking-Mukden Line of the Chinese Government Railways), and Poshan and Tzuchuan coals (in Shantung), Kaiping coal taking up 98%, of which about 10% was cokes.

Timber.

The demand for timber in all parts of Manchuria is obviously on the increase year after year. In 1920, with which we are dealing, both Yalu and Kirin timbers were quite low in price, and this tended to cut down the demand for Japanese timber. Then, the awful economic shake-up followed, and the building enterprises were almost choked, whilst the stocks contracted for previously

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out of speculative motives continued to arrive in succession. Some owners took to dumping, dealing a heavy blow to the importers of timber. The local Branch of the Mitsui Bussan Kaisha, for one, imported Oregon pine on an extensive scale.

Imported Timber with their Origins and Quantities.

	Japanese	Chosen (Korean)	Chinese	American	Total
1916	21,933	279	11,574	—	23,786
1917	22,375	1,106	1,846	1,894	27,251
1918	34,208	—	1,727	1,803	37,738
1919	67,510	68	2,590	12,202	82,370
1920	44,252	3,167	1,875	23,130	72,424

Japanese timber was made up chiefly of Hokkaido timber, shipped from Kitami, Kushiro, Otaru, Hakodate, Osaka, Kobe, and Moji. Of the Chinese timber, the major portion was paulownia from Tientsin, Chefoo, and Tsingtao. American imports were Oregon pine from Portland, Seattle, and San Francisco.

Gunny Bags.

The demand for gunny bags is influenced by the outputs of Staple Produce and also the export trade conditions, but their annual imports may be put roughly at some 20,000,000 pieces. The use of new gunny bags included as one of the Mixed Storage conditions for Beans, as laid down by the South Manchuria Railway Company, served to increase the demand. As to the channels of import, what was imported direct from Calcutta (the original producing centre) amounted to only 160 tons. The balance was brought for most part via Hongkong and Kobe, 159 tons coming from Bangkok and 100 tons via Manila. It was because, at both Hongkong and Kobe, the prices are officially quoted for the local transactions. At Dairen, too, direct business deals with the producing centres are being carried on, and it is likely that the direct import to Dairen may be instituted before long.

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Gunny Bags with Import Channels and Quantities.

	via Japan tons	via China tons	via Elsewhere tons	Total tons
1916	2,834	11,312	975	15,121
1917	12,517	20,207	292	33,016
1918	14,044	7,940	146	22,130
1919	24,981	6,881	283	32,145
1920	22,532	11,476	419	34,427

Tobacco.

The market for tobacco in Manchuria is being steadily enlarged. Especially, after the Russian Revolution, what has been booked via Dairen for Harbin and district has come up to a considerable amount. It may be reiterated that Japanese tobacco is not suited to the Chinese or Russian taste, and that, on this account, the demand for Japanese manufactures is only slightly influenced. The British American Tobacco Co. and the China-South Seas Tobacco Bros. are being rewarded for their constant activity.

Imported Tobaccos with their Quantities.

	Japan.	Chosen.	China.	Europe & America.	Total.
1916	1,789	1,096	14,302	27	17,214
1917	4,482	2,606	14,302	29	21,420
1918	2,416	2,387	17,819	8	22,634
1919	1,830	2,810	27,817	373	32,830
1920	2,449	2,163	29,098	398	34,108

Metals and Metal Ware.

Metals and Metal ware are divided in the present article into three classes—Iron & Steel Manufactures, Pig Iron, &c., and Hardware, including heating appliances, workshop tools, household ware, building materials, pig iron, scrap iron, steel plates, angle iron, steel bars, etc.

Iron and steel manufactures were imported in 1920 to the extent of 41,814 tons, pig iron, etc. 7,856 tons, and hardware 25,288 tons, totalling 74,958 tons, indicating a material decrease from the preceding year.

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Metals and Metal Ware with their Quantities.

		From Japan	From China	From Europe & America	Total
		tons	tons	tons	tons
1916	Iron & Steel Manufactures...	17,349	4,802	1,287	23,450
	Pig Iron, etc.	2,698	96	65	2,859
	Hardware	9,508	3,363	715	13,545
	Total...	29,555	8,261	1,967	39,854
1917	Iron & Steel Manufactures...	26,402	11,121	2,015	39,546
	Pig Iron, etc.	3,833	2,011	3	5,849
	Hardware	13,855	6,801	4,129	24,809
	Total...	44,091	19,933	6,147	70,204
1918	Iron & steel manufactures ...	22,495	5,748	13,181	41,430
	Pig iron, etc.	2,847	3,284	38	6,476
	Hardware	18,851	2,817	13,044	35,263
	Total...	44,193	11,849	26,263	83,169
1919	Iron & steel manufactures ...	42,277	3,892	10,174	56,364
	Pig iron, etc.	12,307	249	56	12,639
	Hardware	30,819	3,697	1,751	36,279
	Total	85,403	7,838	11,981	105,282
1920	Iron & steel manufactures ...	28,734	5,925	7,155	41,814
	Pig iron, etc.	6,691	614	551	7,856
	Hardware	29,788	3,478	2,022	25,288
	Total	55,213	10,017	9,728	74,958

Cement and Lime.

Much cement and lime have been imported as building and industrial materials since 1918, in which the economic inflation attained its zenith. The figures for 1919 were the highest, decreasing substantially in 1920. This decrease in 1920 was due to the retrenchment or suspension of building undertakings from the general economic shock. There were quite a good number of merchants, to whom the arrival of the goods contracted for previously was a source of perplexity and distress. As to the ports of consignment, most of the imports used to come from Japan, but in the year under notice (1920), some 40,000 tons came from Chinnampo, Tientsin, Tsingtao, etc., which fact is worth noting.

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Imported Cement and Lime.

With their Quantities.

	From Japan	From Chosen	From China	Total
1916	13,043	—	186	13,229
1917	12,443	—	172	12,615
1918	29,560	—	1,011	30,571
1919	64,529	1,035	86	65,650
1920	29,844	1,814	2,234	33,892

Rice.

The consumption of rice, which constitutes the staple food-stuff of the Japanese and Chinese, depends on the increase of the populations of the two countries.

In 1919, more than 94,000 tons was imported, but in 1920, the figures were brought down to about one-third, whilst as the result of the census taken, on October 31, 1920, the population in the Kwantung Leased Territory and along the South Manchuria Railway Manchuria Lines was found to have increased by 20% to 687,316.

It was perhaps due in a large measure to the gradual extension of the paddy fields about Fushun and Fengtien (Mukden) and along the Hun River, which tended to decrease the import of rice.

The stern figures prove that both Japanese and Chosen (Korean) rices are being slowly crowded out of South Manchuria by rice grown in Manchuria and imported from Shanghai, which are low-priced for their quality, compared with Japanese and Chosen rices.

Imported Rice, Its Kinds and Quantities.

RICE.

	Japan tons	Chosen tons	China tons	Total tons
1916	2,623	16,872	4,517	24,030
1917	2,818	17,107	8,409	28,348
1918	823	13,206	22,344	36,348
1919	612	6,855	86,840	94,308
1920	467	7,806	25,221	33,494

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Vegetables and Fruits.

Vegetables and fruits are too often scarce in Manchuria, and it seems only too natural that their import should increase year by year. With vegetables, a great variety of them for daily uses are imported largely from Japan. As to fruits, excepting sweet oranges, which come exclusively from Japan, Chinese products take up the major part. Especially, Shantung chestnuts, pears, persimmons, Tientsin peaches, watermelons, and bananas are the greatest favourites.

Imported Vegetables and Fruits.

	Japanese tons	Chosen tons	Chinese tons	Total tons
1916	14,722	79	10,543	25,363
1917	15,101	137	6,683	21,937
1918	5,523	291	7,022	22,836
1919	20,408	416	7,966	28,790
1920	23,482	615	9,043	33,156

Besides the above, 2 tons arrived from Europe, and 3 tons from America in 1916; in 1917, 12 tons came from America; in 1920, 4 tons were imported from Europe, and 12 tons from America.

Sleepers.

Some 20,000 tons of railway sleepers are imported for use in connection with the double-tracking work north of Fengtien (Mukden) and also for the replacement of the old ones. Kushiro (Hokkaido) heads the list as source of supply; Kitami Otaru, and Muroran follow. Excepting the import of 30 tons from Tsingtao in 1918, all the imports undermentioned were from Hokkaido:—

	Tons		Tons
1916	25 995	1919	22,373
1917	28,204	1920	25,673
1918	19,561		

Fish and Other Marine Products.

The Chinese are very partial to fresh and salt fish and all kinds of sea weeds and their import is on the increase. Fresh fish is, however, chiefly for the Japanese, and is brought from Chefoo and even from Moji and Shimonoseki.

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The fishery industry in the Kwantung coast waters is exploited most actively by Japanese fisherman from their home country, stopping here from spring to early winter under the encouragement of the Kwantung Marine Products Union and the Manchuria Marine Products Co. However, the industry is still carried on on out-of-date methods, which give only indifferent catches. Early in October, 1920, a batch of about seventy fishermen from Kagawa and seven other Prefectures, Japan, who were out fishing in the Gulf of Pechili, encountered a terrible storm and got shipwrecked. Not a soul was saved. It is high time that fishing boats and tackles should be improved so as to facilitate greater activity and to make supply even in winter ample.

Imported Fish and Other Marine Products.

	Japan & Chosen	China	Siberian Littorals	Total
	tons	tons	tons	tons
1916	5,172	420	488	6,080
1917	5,310	419	432	6,161
1918	6,634	754	497	7,885
1919	11,645	3,636	501	15,331
1920	15,607	5,181	—	20,788

The figures for the Siberian Littorals in 1917 include 10 tons of marine products from Europe and America. The rest come from Nikolaievsk and Vladivostok.

In 1920, nothing was imported as the effect of the Nikolaievsk Affair.

Cotton Yarn, Cloth, and Fabrics.

Cotton Yarn, Cloth, and Fabrics are the staple imports from Japan, which command the heaviest demand. The unheard of rise of silver in 1919 strengthened the buying power of the Chinese, and in consequence, the living of the lower class Chinese was raised remarkably. This resulted in the record importation of Cotton Yarn, Cloth, and textiles. In 1920, the sharp drop of silver and the general economic dullness reduced the demand, causing a marked decrease in the import quantities. The primary port of shipment is Osaka and is followed by

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Kobe, Nagoya, and Yokohama in Japan. In China, Shanghai comes as by far the first port of shipment, and Tsingtao and Tientsin come thereafter.

Imported Cotton Yarn, Cloth, and Textiles.

		Japan	China	Total
1916	Cotton cloth...	7,543	2,563	10,139
	Yarn	6,073	1,020	7,110
	Textiles	3,760	3,499	7,306
	Total	17,376	7,082	24,555
1917	Cotton cloth...	13,473	6,292	19,811
	Yarn	7,761	1,510	9,279
	Textiles	5,272	3,217	8,591
	Total	26,506	11,019	37,681
1918	Cotton cloth...	19,240	5,207	24,437
	Yarn	7,017	2,380	9,407
	Textiles	6,575	4,314	10,938
	Total	32,842	11,901	44,818
1919	Cotton cloth...	25,805	10,256	36,183
	Yarn	8,691	16,129	24,827
	Textiles	16,250	5,975	22,495
	Total	50,746	32,360	83,505
1920	Cotton cloth...	13,271	5,496	18,860
	Yarn	10,433	3,377	13,822
	Textiles	6,873	4,054	11,000
	Total	32,577	12,927	43,682

Of the above table, what was imported from Europe and America was 61 tons in 1916, 156 tons in 1917, 92 tons in 1918, 400 tons in 1919, and 178 tons in 1920.

Machinery, etc.

Under the head of machinery, etc., fall all kinds of engines, boilers, electricity and gas appliances, telegraphic and telephone apparati, motor engines, spinning machines, etc. The increase of the import of these machines and machinery means the progress of civilization. The fact that in 1920, in which the economic world passed through the most severe shock known in history, the import figures kept increasing should be regarded as highly gratifying.

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Imported Machinery, etc.

	Japan	China	Europe	United States	Total
	tons	tons	tons	tons	tons
1916	1,791	949	177	121	3,038
1917	5,513	707	24	359	6,639
1918	6,967	1,321	1	269	8,558
1919	11,280	1,232	801	1,404	14,717
1920	10,686	701	566	5,241	18,149

Kerosene Oil.

The age, in which kerosene oil lamps were used for lighting purposes, is long past, but, in the interior of China remote from the railways, these lamps are still in extensive use. Whilst, as a source of light, gas and electricity have driven off kerosene oil, the latter has created for itself a fresh market as fuel for various kinds of motors. Few cities and ports in the world do not possess huge oil tanks, and the demand for oil is sustained and even enlarged.

Imported Kerosene Oil.

	Japanese Oils From		American Oils From		
	Niigata	Kobe & Osaka	Shanghai	United States	Total
	tons	tons	tons	tons	tons
1916	3,439	1,518	7	27,218	32,182
1917	3,790	2,247	226	26,000	31,263
1918	2,180	190	16	17,111	19,507
1919	507	110	65	36,219	36,901
1920	750	1	—	15,669	16,420

Note: Speaking of the ports of shipment in 1920, all the Japanese oils came from Niigata, and as to American oil, 6,495 tons were brought from Port Arthur, Texas, and 6,174 tons from New York.

Empty Tins and Drums.

Empty tins and drums are used as receptacles for Bean Oil and other liquids. At first empty oil tins and wooden cases used to be collected about Shanghai, Tsingtao, Chefoo, Tientsin, Chinnampo, Chemulpo, etc. But, as the prices of these tins rose high with the flight of silver, it became more businesslike to manufacture

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new tins in Japan, and from 1919, tins have been made in pieces in Japan to be put together at the places where they are used. The drums are, for most part, of American make and transhipped at Yokohama or Kobe. The drums are made of white oak or Douglas fir, and are shipped in staves from San Francisco, to be rebuilt into barrels at Dairen. The amount of import for 1920 dropped sharply, due to the dull export trade in Bean Oil.

Imported Empty Tins and Drums.

	Japan tons	Chosen tons	China tons	Elsewhere tons	Total tons
191	24,360	3,733	49,570	520	78,182
1917	11,311	6,105	58,613	—	76,009
1918	5,600	7,353	49,615	404	62,978
1919	52,149	2,143	17,281	3	71,576
1920	19,485	286	4,361	—	24,132

Wheat Flour.

Hitherto, the natives of Manchuria used to live on kaoliang, millet, etc. In recent years, with the rise of the standard of their living, the use of wheat flour and cleaned rice has become more popular. The record import figure for the port of Dairen was 53,830 tons for 1913, and the major part of the imports was from the United States, taking up 55%, whilst Shanghai flour came next with 40%. Since the great World War, American flour has ceased to be imported, and this opportunity was availed of by enterprising people in North Manchuria, who founded flour mills on an extensive scale, and strides have been taken forward towards supplying the domestic needs. It is only natural that a decrease in the import amount follows.

Imported Wheat Flour.

	From		
	Japan	China	Total
1916	1,698	13,700	15,398
1917	13,424	14,730	28,154
1918	1,913	28,718	30,641
1919	1,223	29,441	30,664
1920	2,993	13,137	16,130

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The following table gives a list of articles, which were imported in 1920 to the extent of above 10,000 tons, or which had been imported to the amount of over 10,000 tons till 1919, but showed a marked decrease in 1920:—

	1916 tons	1917 tons	1918 tons	1919 tons	1920 tons
Oils	11,261	17,422	48,319	43,108	15,031
Provisions	23,829	24,919	20,276	14,191	14,152
Sugar	13,606	38,059	60,448	36,524	13,601
Liquors	7,444	7,790	10,051	2,714	2,375
Paper	12,272	12,346	14,213	10,246	10,378
Railway materials	8,216	12,456	5,158	48,357	9,787
Medicinal substances	6,044	3,389	4,192	11,118	9,742
S. M. R. Co. Stocks	12,060	24,498	31,190	15,069	6,708
Matches	14,131	7,246	5,565	25,696	4,881

B. EXPORTS.

Of all the exports from the port of Dairen, Bean Cake occupies the first place and Beans, wheat, coal, Bean Oil, kaoliang, pig iron, millet, basil, maize, wild coccons, hemp-seed, sesamum, timber, red beans, melon seed, cement, oils, bone dust, etc., come thereafter. Of altogether forty-eight kinds of exports, half the number are agricultural produce and three-quarters of the total exports are staple products of Manchuria. The export trade of 1920 exhibited a fair amount of animation about the beginning and end of the year, but, during the three summer months—July, August, and September, the business was the dullest. Still it is noteworthy, particularly in the times of universal depression after the great War, that the sum total for the year beat the record figures for the preceding year.

Compared with the previous year, the countries, which recorded a decrease from the preceding year, were Japan, to the extent of 145,681 tons; Chosen (Korea) to the extent of 26,178 tons; and the United States to the amount of 35,237 tons. Those, which showed an increase over the previous year, were China to the amount of 194,198 tons; Russian Far East to the amount of 2,988 tons; the South Seas to the extent of 34,121 tons; and Europe to the extent of 227,269 tons.

At any rate, an increase by 251,480 tons over the preceding year was noted, because of the unparalleled activity of the export to Europe.

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Bean Cake.

The trade of Dairen *minus* Beans and Bean Cake is nothing. The two articles may be regarded as the primary exports from Dairen. Naturally they take the foremost place on the list of exports, the figures for Bean Cake in 1920 reaching 1,131,208 tons, the highest record so far, which are equivalent to roughly 41,000,000 pieces. Supposing that steamers of 3,000 ton class ship away 80,000 pieces each at a time, as many as 513 such ships will be required to take off the above total.

Bean Cake is in extensive and steady demand, being an article of the most popular fertilizer. The exports to Japan fell off by more than 10,000 tons in 1920; those to Formosa increased from 97,292 tons for 1919 to 124,870 tons for 1920. Consignments to Chosen somewhat decreased perhaps due to export by rail. However, there is no denying the rise of demand in the Peninsula. The trade with China is subject to variation, and cannot be hastily commented upon, and the channels of transportation seem also subject to variation according to the market quotations.

The point that is worth special mention is the export of Bean Cake to the United States and Europe. It is true that, during the great War, 505 tons of Bean Cake were forwarded to the United States for cattle-feed; 1,132 tons in 1917; none in 1918; and 3,616 tons in 1919. In 1920, the exports rose at a bound to 12,810 tons, nearly four times as the figure for the previous year.

To Europe, the first experimental shipment of 271 tons was sent out in 1910, and the only next consignment in the same direction up to 1916 was 113 tons in the same year. In 1920, 6,456 tons were shipped out. With the inauguration of the calls at Dairen of regular liners on the European routes of the leading Japanese shipping companies, the business in this particular line bids fair to grow.

Exported Bean Cake.

TO

	Japan	Chosen	China	Europe & America	Total
1916	581,058	21	109,545	*618	691,243
1917	719,962	317	131,456	1,232	852,867
1918	952 416	82	93,850	—	1,046,548
1919	1,057,883	11,664	17,359	3,616	1,090,558
1920	1,047,151	8,641	56,150	*19,266	1,131,208

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Remarks: In the figures for Europe and America in 1916, 113 tons went to Europe, and in those for 1920, 6,456 tons were exported also Europe way.

Beans.

Beans, which are the foremost of the staple products of Manchuria, were exported in 1920 to the amount of 567,129 tons, being a decrease by 41,369 tons from the preceding year. This decrease was owing to the disastrous economic shock, which brought in its train the tightness of money, the sharp fall of silver, and the steady slide of the market price. The Bean crops came out well enough to be average, and a good deal of North Manchurian Beans found its way into South Manchuria. It may be noted that, with the growth of the bean milling industry at Dairen and in the interior, more Beans than in the previous year were consumed as material of manufacture, and this will explain in part a decrease in the export of Beans.

As to exports to Japan, the figures remained much on the same level. The exports to China showed a marked increase.

Those to the South Seas also increased considerably. To Europe, as much as roughly 210,000 tons had been shipped in 1919, and by the side of the record figure, the returns for 1920 indicate some falling-off, but this should not be viewed in a pessimistic light, for, as above stated, the calling at Dairen of the N. Y. K., the O. S. K., and the T. K. K. large typed liners on the European and American routes may serve to open up new business relations with the West.

Exported Beans.

TO

	Japan	China	South Seas	Europe	Total
1916	34,783	51,044	17,869	63,444	167,255
1917	61,439	83,574	11,756	34,411	191,780
1918	248,118	51,965	14,150	8,561	3,228,443
1919	44,169	26,680	24,960	209,334	605,513
1920	345,639	92,768	26,300	92,363	567,129

Of the above table, the shipments to the United States comprised 115 tons in 1916; 600 tons in 1917; 50 tons in 1918; 370 tons in 1919; and 59 tons in 1920.

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Wheat.

The export of wheat from Manchuria had not been thought of seriously till 1920, in which the cereal rose at a bound to the third place on the list of exports. The amount exported in that year reached 438,485 tons, which was of course a record figure. It was said that this heavy drain of this cereal on Manchuria exhausted the available supply therein at least for a time. It was about this time that the Chinese Government prohibited the oversea export of all kinds of cereals on the ground of sending all surplus stocks to the famine districts in North China. This prohibition, taking effect at a short notice, nonplused the cereal exporters, who were, however, soon set at ease because of the ban being withdrawn shortly afterwards.

The Manchurian wheat was shipped to Italy, Great Britain, and Northern Europe. The countries, after passing through the severest ordeals of the long war, found the food supply painfully short, and bargains were closed direct with some of the local exporters. It was the first time that Manchurian wheat was exported direct to Europe and America.

The ports of destination in Europe, to which altogether 325,926 tons were exported in 1920, are as under:—

	Tons
Port Said (for order)	260,643
Geneva	2,233
Naples	14,458
Aven Mouth	6,903
London	22,928
Amsterdam	56
Copenhagen	12,734
Liverpool	5,213
Antwerp	758
Total	325,926

Of 106,735 tons of wheat consigned to Japan, a larger portion was transhipped at Yokohama and Kobe for Europe. The demand for Manchurian wheat from Europe promises further increase.

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Exported Wheat.

To

	Japan	China	Europe	Total
1916...	9,624	2,462	—	5,616
1917...	1,704	10,344	—	12,048
1918...	27,118	27	—	27,145
1919...	46,199	313	—	46,512
1920...	108,020	2,579	{325,926 *1,960}	438,483

Of the shipments to Japan, 87 tons were for Chosen in 1919 and 1,285 tons in 1920. The figure marked with * was for Seattle and Portland, U. S. A.

Coal.

The coal exported in 1920 was 212,589 tons, showing a decrease even from the figures for the preceding year, 1919, which were the lowest since 1916.

During the great war, the demand for coal rose extremely high, and the annual outputs of Fushun Collieries amounting to 2,500,000 tons still failing to meet the increasing need, some Kaiping Coal was imported in 1917 and a quantity of Kyushu Coal in 1919.

About this time, an open cut was excavated, and the daily outputs reached 10,000 tons.

Then came the memorable economic shock in March, 1920, which caused a sudden decrease in the demand for coal. Consequently, the coal storages along the South Manchuria Railway Lines increase.

Exported Coal.

TO

	Japan	Chosen	China	South Seas	Total
1916	185,168	46,840	168,381	107,311	507,700
1917	156,324	70,631	181,620	86,070	494,645
1018	171,363	68,610	110,320	69,389	419,682
1919	110,652	53,728	52,872	—	217,252
1920	103,053	17,127	71,298	21,111	212,589

Bean Oil.

Bean Oil is one of the three kinds of the staple products of Manchuria. The total exports for 1920 were 167,538 tons, being less than for the previous

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year by 15,977 tons, and for the record total in 1918 by 41,737 tons. The ports of destinations remained practically the same, but the shipments to the United States decreased, whilst those to Europe increased. It is a thousand pities that the oil and fat industry promoted at Dairen and in Japan during the war gave any thing but satisfactory results, and still Bean Oil continued to be exported unwrought. The uses of Bean Oil in the West include employment as a substitute for linseed oil in the manufacture of varnish and paint, in the manufacture of medicated soap as fatty acid, and also in the manufacture of candles, oleomargarine, toilette soap, etc. The Chinese have been using Bean Oil as foodstuff and also as a source of light from time immemorial. The exports to Japan being for transhipment for Europe and America mostly, as already remarked, they are bound to decrease with the call at Dairen of Japanese large typed steamers on the European and American lines, as above mentioned.

Exported Bean Oil.

TO

	Japan tons	Chosen tons	Europe tons	America tons	Total tons
1916	29,366	968	45,043	30,167	105,680
1917	20,310	1,642	800	136,528	159,280
1918	5,064	401	75	203,735	209,275
1919	39,219	8,348	70,283	65,665	183,515
1920	24,500	10,265	82,545	50,208	167,538

Kaoliang.

Kaoliang may be called the king of the agricultural products of Manchuria with its annual yield totalling not less than 50,000,000 *koku*. The major part of the immense production is consumed locally as staple food-stuff for the native inhabitants. This cereal does not make a commodity of importance in foreign trade. What was exported to the United States and Japan in 1919 was used mostly as forage. A few years ago, when rice price flew up, some Japanese at Dairen invented how to clean kaoliang so as to make it palatable when mixed with ordinary rice, but since rice itself has become quite low priced, few people even think of the above invention.

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The export of kaoliang to other parts of China in large quantities is traceable to some special cause. In 1917, in which Shantung Province on the other side of the Gulf of Pechili was afflicted with an awful famine, much kaoliang was forwarded thereto from Manchuria. In 1920, again, the six Provinces in North China were visited with a more distressful famine, and 20,000,000 people are said to be on the border of starvation. The export of cereals from Manchuria was tabooed by the Chinese Government, and a plan of extensive consignment of kaoliang to the famine districts was carried out as tabulated below:—

TO

Tientsin	28,339 tons	Tengchowfu	566 tons
Tsingtao	4,497 „	Lanchiakou	557 „
Lungkou	3,573 „	Hutouai	174 „
Chefoo	2,911 „	Chinwangtao	150 „
Weihaiwei	1,978 „		

As Chosen suffered also from poor crops, some 22,000 tons of kaoliang were exported thereto.

Exported Kaoliang.

TO

	Japan tons	Chosen tons	China tons	American tons	Total tons
1916	4,325	2	16,388	2,432	23,147
1917	2,852	—	86,003	996	89,851
1918	2,327	33	58,064	—	60,424
1919	23,303	1,083	7,238	4,545	36,169
1920	15,811	22,253	43,750	{3,687 *351}	84,853

The figures marked with * represent the exports to Europe. Those to the United States comprised 1,039 tons to San Francisco, 500 tons to Portland, and 2,148 tons to Seattle.

Metal Ware.

The metal ware exported consisted of pig iron put out at the Iron and Steel Works at Penchihu and Anshan and also scrap iron. In 1920, the exports totalled 64,119 tons, being 31,412 tons less than in the preceding year. This should not be interpreted as in any sense a general falling off in the demand for pig iron.

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The Japanese Navy facing the completion of the "Eight Dreadnoughts and Eight Cruisers" Plan, any amount of pig iron can find a ready market.

A few words may be put in here about the Anzan iron mine.

The iron percentages of the Anshan ore ranges between 27 and 37%, and the ore is generally compact and its particles are very fine. Moreover, almost the whole of the impurity is made up of silicious stone which impedes the smelting process. This state of things would outwardly seem to put a very pessimistic complexion on the utility of the Anzan ore. However, it holds iron to the amount of over 100,000,000 tons, and this great treasury of nature is bound to be opened somehow. The key to a like treasury-house has already been found in the West. Poor ore of a similar quality may be subjected to a mechanical handling to get its impurities to be removed so as to make an artificial rich ore.

Penchihu ore is decidedly superior in quality to the Anshan ore. It formed the major portion of the exports in 1920, amounting to over 38,000 tons.

Exported Pig Iron, Scrap Iron, etc.

TO

	Japan tons	Chosen tons	China tons	Eleswhere tons	Total tons
1916	41,041	1,049	1,307	522	44,045
1917	42,562	588	1,412	84	44,646
1918	51,103	1,447	1,554	1,687	55,791
1919	90,922	715	3,826	67	95,531
1920	60,863	276	2,826	154	64,119

Millet.

Millet is also an article of the staple produce of Manchuria. It is put out chiefly in North Manchuria, whose annual yield is estimated at not less than 30,000,000 *koku*. The exports in 1920 were 41,460 tons, being 2,220 tons less than in the preceding year. Chosen (Korea) is the heaviest consumer; next comes China, the figures for Japan showing a material decrease. In Chosen, people learned in a recent famine to sell the rice they harvested and to buy millet for food-stuff. A considerable quantity must be exported to Chosen by railway.

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Exported Millet.

	To			
	Japan	Chosen	China	Total
1916	—	—	216	216
1917	636	436	2,580	3,649
1918	5,950	814	593	7,337
1919	15,280	27,548	252	43,680
1920	2,432	29,271	9,757	41,460

In 1919, 600 tons were exported to the United States.

Maize.

Maize is cultivated principally in the south of Fengtien Province and is put out to the extent of about 12,000,000 *koku*. It is also one of the staple products of Manchuria. The exports totalled 22,171 tons for 1920, being a decrease by 7,049 tons from the figures for the preceding year.

In 1919, influenced by the abnormal rise of cereals in price, more than 230,000 tons were exported to Japan. In 1920, shipments were made also to China and the United States. The exports to Japan and the United States are said to be for the manufacture of corn starch.

Exported Maize.

	To				
	Japan	Chosen	China	United States	Total
1916	1,715	—	5,225	—	6,940
1917	1,397	—	18,713	—	20,110
1918	2,335	50	10,152	100	12,637
1919	23,339	22	2,286	3,573	29,220
1920	2,346	510	12,887	{6,028 / *400}	22,171

The figures marked with * were exported to Port Said.

Hemp Seed.

Hemp seeds are produced everywhere in North and South Manchuria. Their total yield, in the absence of reliable statistics, may be placed at about 100,000,000 *kuan* (1 *kuan* being 8⅓ lbs.), most of which is used for manufacture of oil. The total outputs of linseed oil in the three Eastern Provinces in 1915 were

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5,600,000 *kin*. It is used as a food-stuff, a soap-making material, and also as machine oil, and are put to other uses.

Exported Hemp Seed.

TO

	Japan	China	United States	Europe	Total
1916	3,155	493	—	2,425	12,587
2917	7,632	41	1,783	5,406	14,862
1918	6,304	72	501	—	6,877
1919	10,029	95	2,570	224	12,918
1920	12,527	257	1,941	3,212	17,937

Wild Cocoons and Tussah Silk.

The wild sericulture in Manchuria was initiated by emigrants from Shantung Province. It threatens to outstrip Shantung in the magnitude of industry. It is carried on in the Kwantung Leased Territory, the southern extremity of Manchuria, on the south, and about Hailungcheng (in the Eastern Hill, Tungshan, District) and Tunghua on the north. The centres of this industry are in the four Prefectures of Kaiping, Haicheng, Siuyen, and Kuantien, which are very hilly and have an abundance of scrub oak trees growing wild. Wild silkworms are fed on the leaves of this tree as ordinary silkworms are on the leaves of the mulberry plant. Kaiping on the Main Line of the South Manchuria Railway Manchuria Lines is one of the two principal distribution centres in Manchuria, the other being Antung.

Wild cocoons are exported to Chefoo and Shanghai, and tussah silk, too, is put on the Shanghai Market.

Exported Wild Cocoons and Tussah Silk.

To

		Japan tons	Chosen tons	China tons	Total tons
1916	Wild cocoons	486	220	11,382	12,088
	Tussah silk	609	—	3,666	4,275
	Total...	1,093	220	15,048	16,363
1917	Wild cocoons	60	1	24,487	24,548
	Tussah silk	264	1	4,279	4,544
	Total...	324	2	28,766	29,092

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		Japan tons	Chosen tons	China tons	Total tons
1918	Wild cocoons	133	—	27,477	27,610
	Tussah silk	783	—	6,177	6,960
	Total...	916	—	33,654	34,570
1919	Wild cocoons	22	—	227,807	27,829
	Tussah silk	1,014	—	2,675	3,689
	Total...	1,036	—	30,482	31,518
1920	Wild cocoons	184	—	20,009	110,193
	Tussah silk	383	—	3,043	3,436
	Total...	567	—	23,052	23,619

Cereals and Seeds.

Under this head are included barley, cock's shin, basil, rice, hemp-seed, buckwheat, white Indian beans, sesamum, green beans, etc.

The exports in 1920 were 18,186 tons, being 77,020 tons less than in the previous year, in which, due to the flight of cereals in price in Japan, a considerable quantity was shipped to Japan. In 1920, no large bargains were effected owing to the prices at the producing centres being less negotiable. The exports to Europe and the United States also decreased.

Exported Cereals and Seeds.

TO

	Japan tons	Chosen tons	China tons	Europe & America tons	Total tons
1916	471	5	2,050	725	3,249
1917	5,925	3	3,196	3,960	13,084
1918	12,279	16	775	3,196	16,266
1919	86,046	668	1,308	7,193	95,215
1920	12,003	802	2,763	2,618	18,186

Besides the above, the articles, of which more than 10,000 tons were exported in 1920, are as under:—

	1916 tons	1917 tons	1918 tons	1919 tons	1920 tons
Basil...	5,653	4,772	5,434	17,813	26,256
Sesamum...	3,998	2,128	543	10,214	16,928
Lumber	5,998	11,500	11,788	8,576	15,534
Red beans	23,026	24,669	26,714	40,756	14,127
Melon seed	2,175	3,082	2,118	2,302	11,355
Cement	9,921	6,639	12,263	9,240	10,936
Oils	2,946	13,537	40,999	37,048	10,810
Bone dust	3,472	2,215	1,251	12,244	10,796

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PRESENT AND FUTURE OF FUSHUN COLLIERIES.

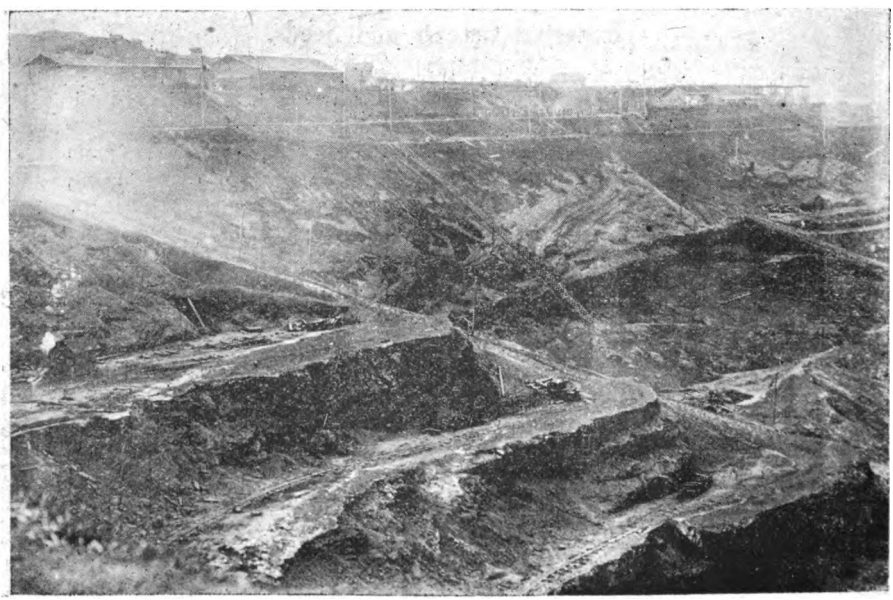
By Mr. S. Otsuru.

The present article is a continuation of the article, which appeared in our March Num berruden the above caption.—Ed. *Light of Manchuria.*

I. Mining Method.

As previously stated, the Fushun Coal seam is one of unparalleled thickness, being 30 ft. thick at the eastern end of the coal field, 200 ft. thick about Oyama Pit, and as thick as 400 ft. in the neighbourhood of the present Railway Station.

The Fushun Collieries passed into Japanese occupation during the Russo-Japanese War. They have lain under management of the South Manchuria Railway Company since 1907. The unique thickness of the coal seam was appreciated even as early as then. But, the Japanese had been initiated into the Western civilization only some thirty years, and they had acquired but little experience with regard to modern coal mining method. Moreover, both the sand-flushing method and the open cut system had made no such advance as they have



KUCHENGTZU OPEN CUT (No. 1), FUSHUN COLLIERIES.

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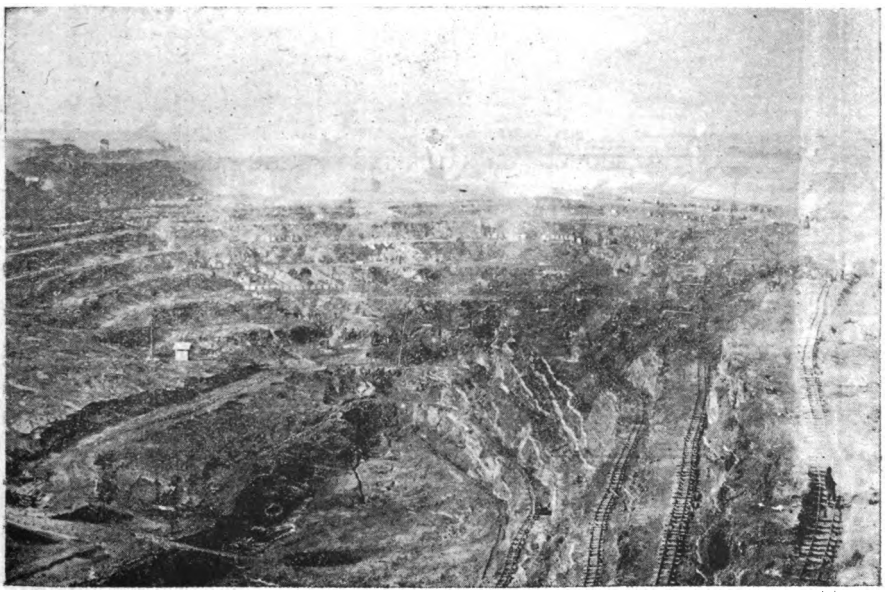
achieved since. Under these circumstances, there was not a specialist who could outline in a concrete form how to operate the stupendous subterranean wealth endowed by Nature.

In order to meet the immediate needs, two pits (one, the Oyama Shaft, 1,234 ft. deep, and the other, the Togo Shaft, 925 ft. deep) were excavated, the main roads being dug out through the coal seam, which was divided into sections at an interval from 30 ft. to 40 ft. vertically. Passages were then dug out for each section separated from one another by from 60 ft. to 90 ft. As the passages were extended forward, the mining operation was prosecuted at the same time. This method might appear quite commendable on the surface, but the output rates were very poor, only 5 or 6% of the coal belt being workable. Thus the passages became developed very rapidly, and in 1911, at Yangpaipu Pit, the major part of the mining section was possessed of passages. The pursuance of the same mining method seemed to be attended with serious risk, and the other pits, too, were plainly bound to fall into a like predicament sooner or later. The total length of the passages reached 250 miles. In order to prevent a collapse, a spontaneous



KUCHENGTZU OPEN CUT (No. 2), FUSHUN COLLIERIES.

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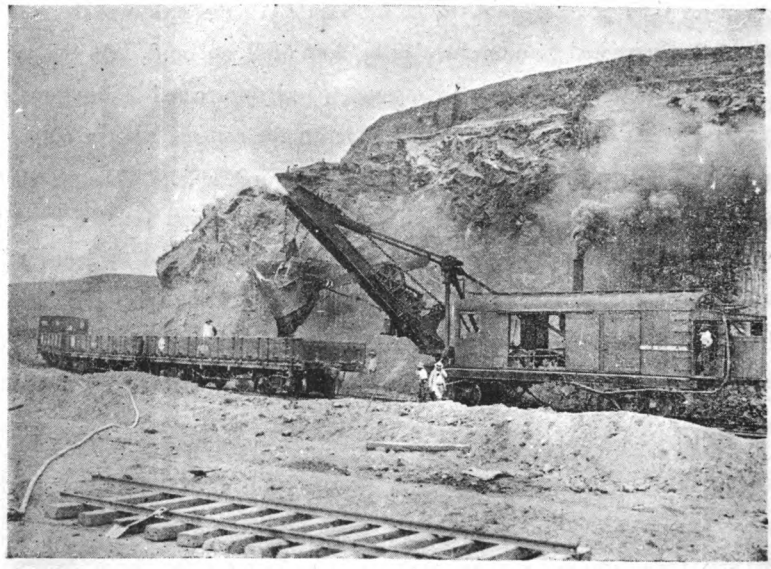
combustion, or like accidents in the passages, a considerable outlay was required for the repair of passages. Besides, the increase of pressure in the Pits conjured up to the technical mind sundry dangers accompanying further mining.

The low output rates, together with the increase of the passage repairing expenses, led the Management to conclude that such a thick seam as the Fushun belt had to be worked by the use of the sandflushing method.



STEAM SHOVEL FOR GATHERING GNEISSIC SAND.

Thereupon, in November, 1912, the installation of the sandflushing equipments began to be experimentally introduced into Yangpaipu Pit, which awaited the first attention. A similar installation was initiated into both Oyama and Togo Shafts in 1913, and in the following year, 1914, it was extended to Laohutai Pit.

II. Sandflushing Method.

The sandflushing method is executed roughly on the undermentioned plan :—

Sand, crushed rock, slag, and such like, which do not get dissolved in water, are sent through the iron pipes together with water to the spots where the sandflushing is intended. Then, the water is drained off, so that the empty space

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may be filled solidly with these matters, and the water may be led up again to outside the pits for further use by rotation.

This method was used for the first time in the mining of the single coal seam, 30 ft. thick, of the Myslowitz Colliery, Germany, twenty years ago. The result was satisfactory, and the same method was adopted in other parts of Europe. In Japan, too, it is experimentally practiced at the three collieries of Miike, Yubari, and Chikuho.

This method is one of absolute necessity in dealing with a thick coal seam lying at a great depth for the increase of mining efficiency, for the prevention of spontaneous combustion, and also for the preclusion of the possible caving-in of the earth's surface. It is said to mark a new epoch in coal mining at the beginning of the Twentieth Century.

III. Effect of Sandflushing.

The Fushun coal seam is, as already stated, a thick one almost without a peer in the world. Apart from the open cut system, what percentage of this thick seam can be mined without the use of the sandflushing method? According to the opinion of an experienced specialist, at the west of Wantawu, it would be impossible to mine even 30%. Especially, at a depth of, say, 600 or 700 ft., the pressure gradually increases, and it will sharply increase at more than 1,000 ft. deep, rendering it extremely difficult to work as much as 20%.

Supposing that 20% of the whole coal wealth should be mined, the constant combating with the spontaneous combustion recurring with alarming frequency will demand an outlay almost as heavy as that wanted for the sandflushing.

There was a time when, before the sandflushing was introduced, only about 6% of the coal hoard had been mind, and yet spontaneous combustion often took place, causing collapses to the roofs of the passages, and also the earth's cracking because of the increasing pressure on the passages.

As to what percentage of the coal reserve can be worked by means of the sandflushing method, it varies according to the thickness of the seam, the conditions inside the pits, etc., but theoretically speaking, 100% of the seam might seem minable, excepting only the thin layers lying in the banded seam that are hardly

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worth mining, but, in bare fact, the output rate decreases as the seam grows thicker. The decrease will be more pronounced in such parts of the coal seam as have got damaged, lying at a great depth, by the prosecution of excavation on the old mine timber system.

From the past experiences, the output rates may be roughly estimated as under :—

Thickness of seam.	Worked by New system		Old system		Old system (heavily damaged)
	smaller depth	greater depth	smaller depth	greater depth	
300–400 ft.	60–70%	55–65%	—	—	—
200–300 ft.	70–75 "	65–70 "	60–65%	55–60%	40–50%
130–200 ft.	75–80 "	70–75 "	65–70 "	60–65 "	50–60 "
80–130 ft.	80–85 "	75–80 "	70–75 "	65–70 "	50–60 "
30–80 ft.	80–90 "	75–85 "	—	—	—

Let us now suppose that, by means of the sandflushing method, 65% on an average of the whole coal seam will be minable. The open cut system may be utilized as far as it is commercially workable west of the Yangpaipu River. East of the River, the open cut system may be applied to all the coal seam lying above 200 ft. on an average under ground, and the other parts lying deeper than 200 ft. from the surface of the ground may be mined by underground working. Next, we will suppose that as much as 20% of the coal seam is minable without recourse to the sandflushing method.

Then, in reference to the coal seam lying higher than 2,500 ft. from the surface of the ground, we shall obtain the following estimates :—

	Tons.
Coal hoard in underground working zone	689,000,000
Minable quantity without sandflushing (20%)	138,000,000
Minable quantity by means of sandflushing (65%)	448,000,000

Thus, by means of the sandflushing method, 310,000,000 tons more will become minable.

Calculating the net profit on the coal output, when worked without sandflushing, at ¥2 per ton, and supposing that, by the use of the sandflushing method, the per ton net profit of ¥2 be reduced to ¥1 per ton, the excess profits amounting to ¥170,000,000 will be realized by the application of the sandflushing method.

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Besides, the very fact that this enormous quantity of coal lies within the minable potentiality of the Japanese will be a matter of immense importance from the standpoint of the national economy.

Advantage of filling up Disused Passages.

Sandflushing has been applied with remarkable advantage to the filling up of the disused passages. The passages are solid to the depth of from 300 to 400 ft. under ground, and the rate of decay of the mine timber is also low. As it becomes deeper, the coal loses in compactness; besides the mine timber becomes more susceptible to decay from the rise in humidity. Collapses have taken place in the passages, and it has cost much labour and money to keep them in good shape. Since the introduction of the sandflushing method, all the labour and money have been saved, going a long way to economize the expenses.

Decrease of Pressure Inside Pits.

The filling up of the disused passages with sand, etc., has greatly reduced the pressure inside the Pits. Then, the filling up of the disused passages and goafs has removed all spaces where combustible gas can accumulate. This prevents spontaneous combustion.

There can be no preventive more effective than sandflushing against spontaneous combustion. No fire of whatever kind can exist within reach of the sand and water. Even without the reach of the sand and water, the filling up of the passages, instead of constructing an ordinary air-tight dam, will effect the most complete sealing fatal to fire.

Next, as to how much the sand, etc., used in the filling-up can be compressed, the rate varies according to the quality of the filling material, the depth from the surface ground, etc., but speaking of the sand of the best quality, the rate of compressibility is 5%. In other words, the space filled up to the extent of 100 ft. may be compressed to 95 ft. With regard to the mixture of sand and earth, the rate will rise to 10%.

At Fushun Collieries, no effect of compression is yet discernible on the surface of the ground, but, inside the pits, the phenomenon of compression is already quite apparent to the extent of 7%. The finest results attained in Europe

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have never been less than 3%, and 6% is allowed as the common rate of compression.

We shall now take up how the sandflushing is conducted.

Sandflushing Equipment.

(1) Gathering of Sand.

At the Fushun Collieries, as filling up materials, river sand and gneissic sand are used in the largest quantity. As the distance from the place, where river sand is gathered, to the Collieries increases, the use of gneissic sand may predominate. Luckily, gneissic sand is found in an unlimited quantity on the southside of the mining district.

The sand-gathering appliances include:—

9 Steam shovels for gathering gneissic sand and { 6 with capacity for 2.5 yards, and
" for loading sand into electric cars { 3 with capacity for 1 yard.

2 Drag line excavator for use at sand depots with capacity for 3.5 yards.

1 Bucket excavator for gathering river sand with capacity for 200 cubic metres per hour.

(2) Sand Cars.

For carrying sand from the place for gathering sand to the nearest points for sandflushing operations, railway lines of standard gauge were constructed, the cars being drawn by electric locomotives. The main lines are 13.4 miles in length, the grand total being 43.4 miles.

(3) Goods Cars.

One goods car of 30 ton capacity can load 3 cubic feet of sand, etc. The total number of goods cars is 290, and the daily average number of cars used is 280.

(4) Locomotives.

There are seven 50 ton electric locomotives in addition to three 25 ton locomotives.

Besides, for shunting purposes in the sand-gathering grounds, two 50 ton steam locomotives are used.

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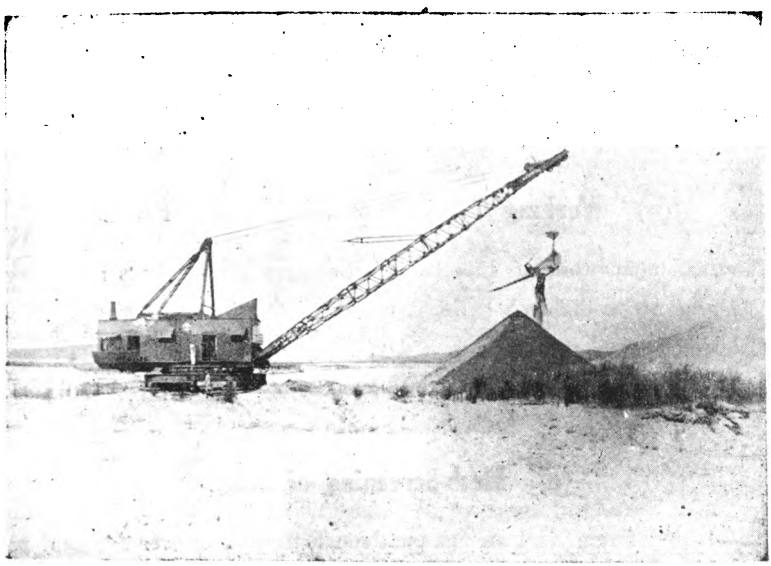
IV. Sandflushing Equipments.

The sandflushing equipments are installed in principle as close to the outcrop as possible, so as to make them available for application anywhere in that particular section of the coal vein. There are twelve such installations and thirteen others now in course of installation.

The range of efficiency of a sandflushing installation is generally eight times the depth, and as the average gradient of the iron pipes is not more than 1/10, the sandflushing installations are provided at the Fushun Collieries at an interval of from 600 to 800 yards. Every second one is larger and more powerful than its neighbours directly next thereto.

The largest plants of the kind are located at Oyama and Togo Shafts. The sand packet at each place is capable of holding 500 tons of sand. Each packet has a double standard gauge track running over it, and on the double track six 30 ton cars may be unloaded at a time.

The other packets, too, are equipped similarly with a double railway track, but its capacity is between 100 and 150 cubic *tsubo*.



Drag line excavator for use at Sand Depots, Fushun.

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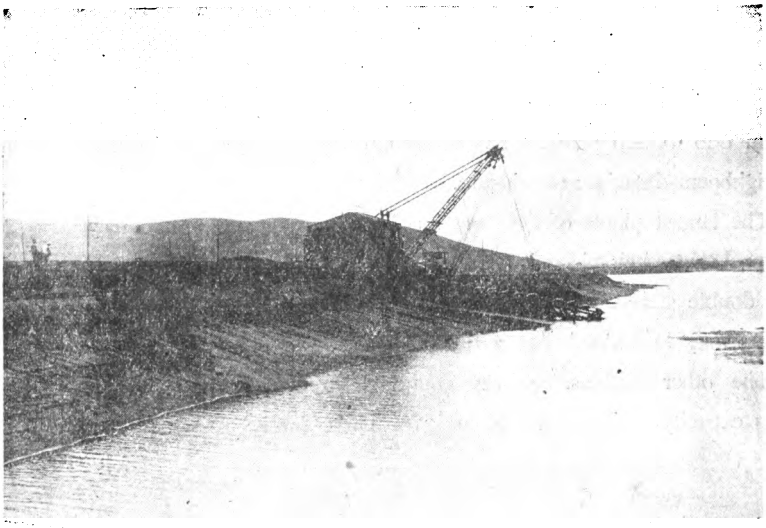
(a) Sand and Water Mixed.

As the sand is comparatively fine, it is mixed with jet water. In winter, it being impossible to leave the sand exposed to the cold air outside, an artificial tunnel is pierced through the sand in the packet, and holes are made into the side of the tunnel, so as to let the jet water play thereinto.



Bucket excavator for gathering river sand, Fushun.

(b) Working Capacity of Sandflushing Plant.

The maximum working capacity of the sandflushing plants range from 50 cubic *tsubo* to 250 cubic *tsubo* per day, excepting Oyama and Togo plants which can fill up more than 400 cubic ft. a day.

All the plants combined can fill up 1,300 cubic *tsubo* a day.

(c) Mesh-Screening of Sand.

Gravels and frozen sand are first put through the meshes over the sand packets and then again through the 2½ in. trommels.

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(d) Pressure Water.

Pressure water is required to mix the sand with water. Turbine pumps, with a capacity for 150-200 cubic ft. per minute and the head of 400 ft., are used. The pressure at the mouth of the nozzle is about 120 lbs.

V. Sandflushing Returns.

Since the sandflushing method was introduced experimentally to Yangpaipu Pit towards the end of 1912, about 1,378,000 cubic *tsubo* of sand had been used by 1919. 57% of this enormous amount of sand was employed for mining purposes; whilst the other 43% was for filling up the old pits.

Sandflushing Pit, Oyama.

Looking back over the eight years from 1919, for the filling up of the old pits, 61% of the whole of the sand gathered was used in 1912, 51% in 1915, 56% in 1916, and 55% in 1917, showing what a large share of attention was claimed by this particular line of work.

In 1919, 74% of the total sanflushing work amounting to 387,000 cubic ft. was for mining purposes, forecasting that the rate for mining purposes will increase as time goes by.

Next, we shall see what are the ratios of the coal outputs obtained through the sandflushing to the aggregate coal outputs.

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They were 3% in 1913, 9.5% in 194; 18% in 1915; 30% in 1916; 34% in 1917; 52% in 1918; and 55% in 1919.

The ratios were steadily rising.

Again, as against 21,400,000 tons of coal put out from 1907 to 1919, as much as 5,090,000 tons or 29% of coal was obtained through the sandflushing.

We shall now look into what amount of coal is minable to 1 cubic ft. of sand gathered. By dividing the coal outputs by the total quantity of the sand used, we obtain 6.467 tons of coal. It may appear that comparatively much sand is wanted, but the sand gathered will be reduced by about 1% when mixed with water; about 2.5% will be lost as stones, etc.; and as much as some 13.5% will be further lost with the water. Thus, 1 cubic tsubo of sand brought by the sand train will be reduced to 0.85 cubic tsubo net.

The following is a table giving the sandflushing returns with the coal outputs through sandflushing :—

	Sand used for sandflushing		
	For filling up old pits	For mining purposes	Total
1913	4,200 cubic tsubo	8,900 cub. tsubo	13,100
1914	22,500 „	26,400 „	48,900
1915	64,300 „	61,300 „	125,600
1916	120,800 „	95,500 „	216,300
1917	142,900 „	119,200 „	262,100
1918	132,200 „	190,000 „	322,200
1919	101,700 „	286,100 „	387,800
Total	588,600 „	787,400 „	1,376,000

	Coal outputs through sandflushing	Sand used for sandflushing: For filling up old pits	Sand used for sandflushing: For mining purposes	Coal outputs to cubic tsubo of sand
1913	63,100 ton	32%	68%	7.01 ton
1914	203,300 „	46%	54%	7.69 „
1915	292,400 „	51%	49%	6.39 „
1916	614,900 „	56%	44%	6.43 „
1917	799,400 „	55%	45%	6.70 „
1918	1,320,690 „	41%	59%	6.95 „
1919	1,701,600 „	26%	74%	5.94 „
Total	5,095,300 „	43%	57%	6.46 „

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Cost of Sand Flushing.

Sandflushing costs more than generally supposed. In Upper Silesia, Germany, where the sand flushing method was used most extensively and also was most advanced in 1912 prior to the great War, the cost was from 1.20 mark to 0.52 mark per ton on an average. At the Fushun Collieries, in 1916, the per ton cost was 72.59 sen, but as the wages and materials steadily rose, it ascended to ¥1.128, being an increase by about 50%. It should be noted that this increase includes the depreciation funds for iron pipes and other equipments at the rate of 17.3 sen and 24 sen respectively.

The following gives the details of the sandflushing cost:—

Coal mined through sandflushing ...	tons 470,916	tons 597,955	tons 501,512	tons 475,461	tons 2,045,844
Sand flushed into	cub. tsubo 76,110	cub. tsubo 85,576	cub. tsubo 72,771	cub. tsubo 71,060	cub. tsubo 305,517
Cost of sand...	¥ 1.07 per tsubo	¥ 1.42	¥ 1.68	¥ 3.80	¥ 1.72
	0.17 per ton	0.20	0.24	0.42	0.25
Flushing cost	0.46 per tsubo	0.60	0.73	0.90	0.67
	0.07 per ton	0.08	0.10	0.13	0.10
Flushing appliances cost ...	0.29 per tsubo	0.38	0.59	0.84	0.52
	0.04 per ton	0.05	0.08	0.12	0.07
Sundry costs	0.09 per tsubo	0.14	0.11	0.22	0.14
	0.01 per ton	0.02	0.01	0.03	0.02
Total	¥ 1.93 per tsubo	2.56	3.13	4.78	3.06
	0.31 per ton	0.36	0.38	0.75	0.45
For redemption of capital expenditure with interest	2.55 per tsubo	2.88	2.84	2.76	2.76
	0.41 per ton	0.41	0.41	0.41	0.45
Grand Total...	4.49 per tsubo	5.45	5.08	7.54	5.82
	0.72 per ton	0.78	0.86	1.12	0.87

VI. New Method of Excavating Shaft.

As already stated, mining through sandflushing is the only economical mining method for a coal seam lying at a great depth. But such seams can be reached by means of a shaft or an incline.

In fact Oyama Shaft has a depth of 1,234 ft., and Togo Shaft 925 ft. In those days, in which the two Shafts were excavated, the shafts were so planned as to strike the coal seam at a certain depth and the main roads were excavated right through the seam. It was intended to economize the excavating cost of the Shafts, and, at the same time, the excavation of the passages itself meant coal

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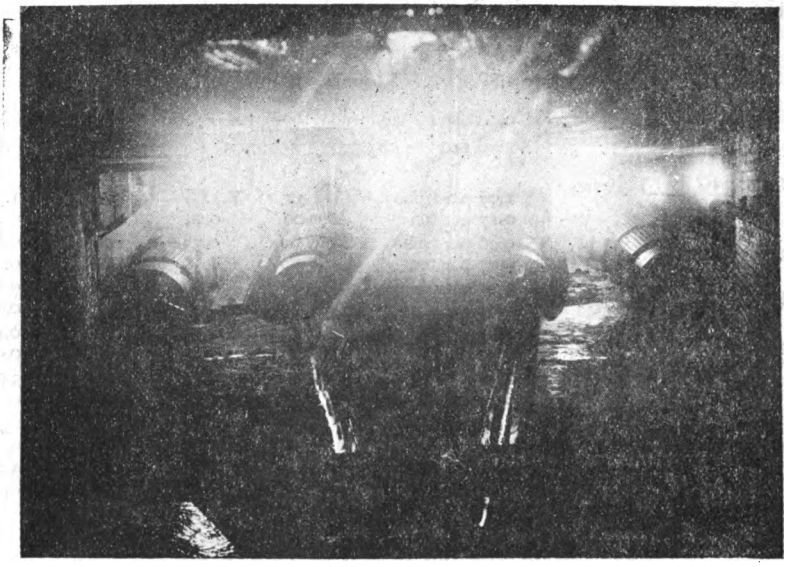
mining operation. This might appear very profitable, but really it has involved various disadvatages as mentioned under:—

Firstly, in order to maintain the two shafts, 17,000,000 tons and 10,000,000 tons of coal cannot be mined in the immediate neighbourhoods of both Oyama and Togo Shafts respectively, it being absolutely necessary to preserve those enormous amounts of coal as the safety pillars. Calculating the value of coal at ¥1 per ton, the sum of ¥27,000,000 must be lost.

Secondly, it is found impossible from experience to preserve intact the bottom of the Shafts in the thick coal seam. Only ten years have passed since both



Trommel Room, Sandflusning Plant, Oyama.

Shafts were excavated, and already a disturbance has appeared in the foundation of the Shaft, creating great difficulty in ensuring the preservation of the Shafts, and it is considered as next to impossible to preserve them intact.

Thirdly, the excavation of the main roads in the coal seam itself may appear profitable at the start, as the excavation meant coal mining. But, the frequent collapse of the roof and sides and the occurrence of spontaneous combustion require a large outlay for their repairing, and this outlay will steadily expand.

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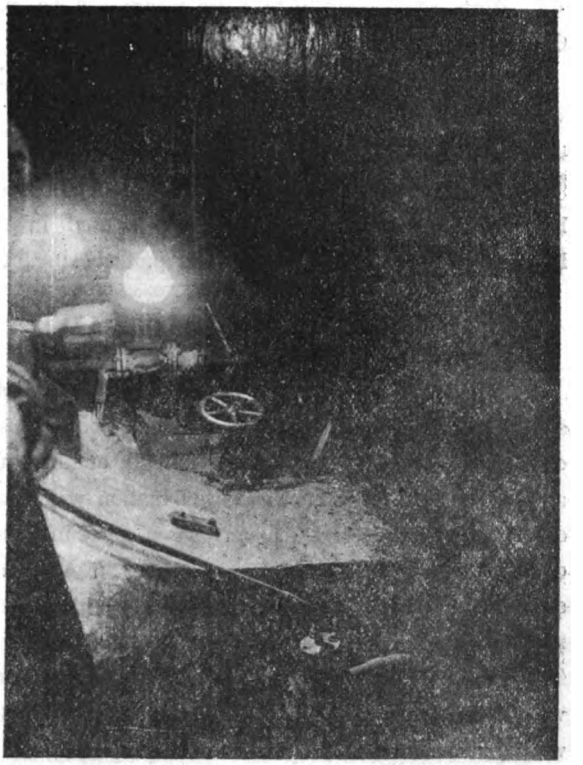
The time is bound to come when the preservation of these main roads will be no longer possible, and it is being recognized that by the excavation of all passages in the coal seam, as such has been part of the mining plan for the Fushun Collieries, the safe working of a thick seam as the one under notice, even through sand-flushing, can hardly be expected.



Flushing mouth, Sandflushing Plant, Oyama.

Cross Cut Excavation.

How can these drawbacks be remedied then?

Shafts may be excavated at the rear of the outcrop or the southern extremity of the coal seam on the rock under the coal seam, or so as to strike the coal seam by means of cross cut.

This is by no means a new method. It is already well developed in Europe. The working of the untapped portion of the seam in its eastern part has been taken in hand according to this method by constructing a pair of shafts at Lungfeng. These shafts are to be 2,500 ft. deep and are estimated to take 5 years' time and the outlay of ¥12,000,000.

Then, the main roads belonging to these Shafts are to be all excavated through the rock under the coal seam or a thin coal seam.

Thus the above mentioned shortcomings may be steered clear of.

At Oyama Shaft, some of the important passages were excavated in the rock under the coal seam several years ago.

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Shafts of the given type are planned to be excavated at Laohutai Pit and Oyama Shaft.

By the completion of these shafts and by the filling up of the hollows by sandflushing alone, the deepest portion of the thick coal seam may be mined to satisfy the most sanguine hopes.

As to how the portion of the coal seam near the surface of the ground should be worked, the open cut system which is used in America most extensively is believed to be the most rational and profitable method.

VII. Open Cuts.

Excavation by the Open Cut was begun at Fushun Collieries in 1914. As a result of prospecting at the western end of the Fushun Coal bed, the existence of a thick coal seam 40 ft. under ground at the east of the Kuchengtzu River and at the north of Eushun Railway Station was discovered, and the excavation of the present Kuchengtzu Open Cut was put in hand in April, 1914. The new open cut was opened to business working in April, 1915, putting out 300 tons of coal a day. On the outbreak of the great World War, demand for coal was increased sharply, and as the outputs from the then existing Shafts and Pits were feared to fall short of satisfying the rapidly increasing demand, the excavation of a second open cut was commenced at the foot of the hill at the east of Chienchinchai Pit. This, too, was opened to business operation in April, 1919, the daily output being 200 tons.

The stripping work at the two open cuts above mentioned had been carried on with three steam shovels each capable of stripping ten cubic tsubo of earth and sand per hour and six larger steam shovels, each capable of stripping 34 cubic *tsubo*.

Lately, the Kuchengtzu open cut is putting out 1,200 tons a day, and the Chienchinchai open cut 1,600 tons a day.

The annual outputs for the two open cuts are as under:—

	Kuchengtzu	Chienchinchai
	Tons	
1914	2,100	
1915	102,700	
1916	173,400	Tons
1917	272,300	200
1918	260,600	66,000
1919	231,200	300,000
1920	237,000	373,000
Total	1,279,900	740,400

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The Kuchengtzu open cut struck recently a siderite mine, and the Collierie Management drafted a plan of extending the open cut system towards the end of the fiscal year 1920. In consequence the Chienchinchai open cut is being extended westward to the south of the Railway Station of Fushun. The Kuchengtzu open cut is called Open Cut No. 1 and the other Open Cut No. 2.

VIII. Charactesistics of Open Cut.

As stated often before, in dealing with a coal seam of unparalleled thickness like the Fushun bed, the primary question is how the rate of mining the coal bed can be raised. In answer to this question, the sandflushing method has come to be applied. However, even at the outlay of almost ¥1.10 per ton of coal mined, the minable rate can hardly be raised above 70% by the use of the sandflushing method. On the other hand, by means of the open cut system, nearly the whole of the coal seam may be mined. On this account, as far as the mining cost, natural conditions, and technical possibility permit, the open cut system may be regarded as idealistic for the thick coal bed like the Fushun seam. This point may be counted as the first characteristic.

Secondly, the open cut system will make quick mining possible, and this in a comparatively large quantity.

As matters stand, it will take four or five years' time to excavate a shaft capable of yielding, say, 2,000 tons of coal a day. But the two open cuts now existing could give about the same daily output only in the course of a year or so.

Moreover, actual mining can be effected by blasting; in loading the output into the railway cars, steam shovels may be used; and in transportation, large typed goods cars may be employed; by the use of these equipments, this system is excellently suited to mining in very large quantities.

In the plan of the South Manchuria Railway Company, by which the annual total outputs of the Fushun Collieries are expected to be increased to 8,000,000 tons, the outputs from the open cut working are put at about 3,400,000 tons. The area required for these outputs is only less than 6,000 ft. square. For the mining of the remaining 4,700,000 tons, the whole area of the Fushun coal bed, excepting what is set apart for the open cut system, that is, about 9 miles from

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east to west, the total length of the passages reaching about 1,000 miles, has to be tapped.

This may give a good idea of how effective the open cut system is for increasing the outputs.

Without recourse to this system, it would be simply impossible to expect to increase the annual outputs to two and half times as the present maximum amount. It will be also an idle dream to hope to raise the annual total yield to 10,000,000 tons by underground working alone.

Thirdly, there are chances for reducing the mining cost.

(a) Use of mechanical appliances:

As stated already, stripping work may be conducted by means of steam shovels, excavators, etc.; coal mining by blasting; loading into cars by shovels, etc.; and for transportation, the standard locomotives may be brought to use as far as it is possible to do so technically. By all these means, a material reduction of the cost on an extensive mining plan seems to lie within range of possibility.

(b) Mine timber may be dispensed with.

Of the items of the mining cost, mine timber forms an important factor. At present the Fushun Collieries want 15 or 16 cubic ft. of mine timber per ton of coal put out. The cost in this respect threatens to increase as the passages increase in length. Even with the almost inexhaustible forestry wealth on the Yalu and in Kirin Province available for supply, the distance of transporting the timber from the forest land to the nearest river or railway is said to be increasing by about 2½ miles a year. Therefore, the saving of the cost of the mine timber by itself should be held as a sustantial economy.

(c) As to mining coolies, no such skill or experience as is required of underground miners is wanted. This is a decided advantage in recruiting the coolies and also in point of wages.

Fourthly, there is no danger from explosion or spontaneous combustion, or such like.

Fushun coal is volatile or gaseous. Moseover, the most ignorant Chinese coolies are used. These go to make accidents like explosions liable to occur.

Thus, the open cut-system permits of decreasing the mining cost, but on the other hand, a large capital must be fixed for the installation of sundry equip-

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ments. To what extent the mining cost can be cut down, compared with the underground working, is a question that can be determined by the study of various premises.

Even supposing that the mining cost for the open cut-system is as heavy as that for the underground working, the dual advantage, that is, firstly, the possibility to mine what cannot be obtained through underground working, and secondly, the possibility to mine a far larger quantity of coal quickly than can ever be expected of the undergound working is another important characteristic of the open cutsystem.

XI. Extensive Open Cut system for Fushun Collieries.

Why has the plan to extend the open cut system to the very site of the flourishing Colliery Town of Chienchinchai, which is doomed to a complete effacement, been drawn up and adopted?

As repeated several times, a thick coal seam like the Fushun bed must be exploited by sandflushing. However, the shrinkage of the space filled up by this method cannot be lessened than 3% even from the finest results attained in Europe, as much as 6% being held as common. This fact makes its disastrous effect on the buildings on the surface ground quite too obvious, especially when the coal seams to be tapped is over 100 ft. thick on an average, the thickest part measuring over 400 ft.

The present Colliery Town stands over the portion of the coal seam from 200 to 400 ft. in thickness, and on this account, no matter what kind of the most up to-date mining method may be used, the security of the Colliery Town cannot be guaranteed.

Next, the recent development of the excavating machinery has been remarkable, especially in the United States. The excavation of the Panama Canal clearly demonstrates the wonderful working capacity of the machinery, and incidentally also at what lower cost the work can be accomplished than use of manual labour, however cheap.

Since this new truth was revealed, the stripping method has grown very popular in the United States in coal mining etc., and it has been shown that to

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a certain extent at least, this method is decidedly more economical than underground working.

The area, in which both Kuchengtzu and Chienchinchai are situated, holds a portion of the coal seam from at least 300 to 400 ft. in thickness, and this only about forty ft. deep. Further, the seam lies in a curve, and on this account it is best suited to working by open cut.

In order to meet the rapidly rising requirements for coal in Manchuria and Chosen, the open cut system is by far the most effective method.

All these considerations have induced the Management to draw up the plan of extending the open cut to 6,000 ft. each in length and in width.

It is regrettable that, in order to carry out the above plan the present Colliery Town of Chienchinchai must be removed elsewhere, but a careful weighing of the above mentioned reasons will easily convince a rational mind of the predestined necessity of shifting it.

Then, to what depth is the open cut system workable? This question can hardly be decided at the present stage of scientific progress, but will be decided by the technical potentiality and also the funds available for the purpose as the work is pushed forward. The cost of working the open cut, too, depending on the depth of the cut, its calculation is a rather complex problem.

According to the instance of the open cut of the anthracite mine in Pennsylvania, U. S. A., the open cut-system is more economical than underground working as far as the debris is 2.75 times as much as the coal mined. Even if the working cost by open cut is higher than that by underground working, the former system will remain workable provided the market price permit.

By the plan of the first open cut, the total amount of debris is estimated at about 50,000,000 cubic *tsubo* and that of the coal outputs at 17,000,000 cubic *tsubo* or roughly about 100,000,000 tons, the ratio of the debris to the coal outputs being about 1 to 3, which ratio is much on the lines of the American instance mentioned above.

Supposing that the underground working system were to be adhered to, and the most excellent mining returns to be realized, say, to the extent of 70% of the estimated coal hoard above mentioned, still the remaining 30% or 30,000,000

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tons would have to be left buried in vain. This amount will be made wholly available for human utility by the use of the stripping system.

Even if the working cost for the two systems should be equal, still the above mentioned advantage will tip the balance in favour of the stripping or open cut-system.

In a few words, in working the deepest part of the Fushun coal seam, shafts are to be sunk in such way that the passages will crosscut the coal seam, and the flushing work is to be employed. The shallower portion is to be worked by the stripping system as far as technical skill and mining cost permit.

This key to the permanent working of the immense coal bed of Fushun has been won, it must be remembered, as the reward for the costly sacrifices and experiences of the past fourteen years.

From the mining returns for the fiscal year, 1919, the outputs by the flushing work amounted to 58%, and those by the stripping system to 19%, and the balance of 22% was yielded from the Lungfeng, Hsintun, and Wantawu, Pits, in which the flushing work is not yet carried on on an extensive scale.

As time goes by, the outputs by the stripping system will increase steadily, and will become as large as those by the flushing system in no distant future.

		Outputs by			
		Flushing work	Open cut	Underground working	Total
		tons	tons	tons	tons
1915	Outputs	392,000	102,000	1,667,000	2,161,000
		18%	5%	77%	100%
1916	Outputs	614,000	173,000	1,255,000	2,042,000
		30%	9%	61%	100%
1917	Outputs	799,000	272,000	1,239,000	2,310,000
		34%	12%	54%	100%
1918	Outputs	1,320,000	327,000	873,000	2,520,000
		52%	13%	35%	100%
1919	Outputs	1,701,000	564,000	661,000	2,926,000
		58%	19%	23%	100%
Total		4,826,000	1,438,000	5,695,000	11,959,000
		29%	8%	63%	100%

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CURRENT NEWS.

NEW JAPAN-DAIREN CABLE LINE.

Its Opening Celebrated.

On April 9, 1921.

On April 9, at 11 a.m., the opening exercises of the New Dairen-Nagasaki cable line were held at the banqueting hall of the Yamato Hotel, Dairen by Post Master-General J. Kato, of the Kwantung Government.

Director-General S. Sugiyama of the Kwantung Government, Acting Civil Administrator Ogawa, Dr. Y. Kuratsuka (in charge of the Dairen Branch of the Public Works Office, Dairen), Superintendent Ohkochi (of the Marine Bureau), Director Tomita of the Engineering College, Mayor Murai, Customs Commissioner Ebara, Director K. Nakagawa of the South Manchuria Railway Company, Messrs. Ohta (Bank of Chosen), Suitzu (Yokohama Specie Bank), Yasukawa (Oriental Development Co.), Hamada (of Messrs. Suzuki's), etc., totalling about eighty representative people, together with the officials of the General Post Office and the Dairen Post Office, were present.

Post-Master General Kato gave an interesting address to the following effect:—

On the occasion of the celebration of the Nagasaki-Dairen cable line, your kind presence is appreciated as a mark of high honour to us.

Up to a couple of years ago, the telegraphic communications between Japan and Manchuria were maintained with the Dairen-Sasebo cable line and the Seoul-Fengtien telegraph line through the medium of the Chosen line. As the telegraphic traffic grew, the Tokyo-Dairen line was finished by May, 1919. In the following month, the Osaka-Fengtien (Mukden) line was constructed, and now the new cable line, the completion of which is commemorated this day, has been added.

That the Japan-Manchuria telegraphic service has thus been supplemented in rapid succession is due chiefly to the relations between Japan and Manchuria having become closer and more important, which exigency is a matter of sincere

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congratulation to us who are directly interested, and, in our opinion, also to the State.

I shall now proceed to recount how the construction of the new cable line came to be undertaken.

The Sasebo-Dairen cable line and the Seoul-Fengtien telegraph line fell short of meeting the increasing demands, and moreover the existing Sasebo-Dairen cable line, which was originally laid in a hurry out of strategic necessity during the Russo-Japanese War, is unsuitably located for use in peace time, besides the line being defective and therefore subjected to frequent interruptions. In order to expedite the transmission of the messages and ensure the absolute security of communications, the construction of an additional cable line was considered as urgent, and an appeal was filed with the Communications Office, Tokyo. But the Communications authorities themselves had their minds and hands full with the home services, having little attention left to look after the Japan-Manchuria communications. The Kwantung Government, in its straitened circumstances, could not afford to undertake the construction work single-handedly. Accordingly, as an expediency, the Tokyo-Dairen line was laid, but owing to its susceptibility to the weather and also to the fact that it is a long-distance land wire extending over 2,000 miles, this line, too, has been liable to damage from one cause or another.

The Sasebo-Dairen cable line became interrupted altogether nine times in the course of twenty-three months from July, 1917, to May, 1919, especially in May, 1919, twice in one month. Notwithstanding there being the Tokyo-Dairen line opened to traffic, a serious congestion of business was experienced, causing an unheard of delay in transmission of messages. At a loss as to what to do, I discerned a ray of hope in asking the South Manchuria Railway Company to build the much needed new cable line and to loan it to the Communications authorities. A representation was made to the same effect. Luckily this proposition was received with profound sympathy by Dr. Nomura (President) and Mr. Nakanishi (Vice-President) of the South Manchuria Railway Company, who both rendered us an ungrudging support. The consequence is that, under the directions of the higher authorities, we have had the great pleasure of celebrating this auspicious occasion.

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Needless for me to say, the South Manchuria Railway Company, being a corporation invested with a special mission, has carried out a large number of expensive undertakings of public utility, but this new cable line dispensing incalculable benefit to all enterprises and to every body alike, its completion at an enormous outlay is, in my opinion, an achievement worthy of special mention. I beg to take this opportunity to tender our profound thanks to the Railway Company.

The new cable line is 692 nautical miles in length, connecting with six miles of shore lines. Its construction has cost about ¥2,580,000 in all and has taken twenty-two months to finish the work after its additional construction was decided upon.

As to its transmissive capacity, it is premature to pass any definite remark since it has been barely opened, but I believe it to be the most powerful of all the existing lines of the kind between Japan and Manchuria.

Now that the new cable line has been acquired, it behoves us all to give it full play to the end of contributing to the furtherance of the common weal with your sympathy.

In passing, Mr. J. Kato (Post Master General) was relieved of his post on his own request on April 25, and was succeeded by Mr. K. Sugino. He held his post for 13½ years, and his retirement for private reasons is widely regretted. He will leave Dairen on May 10 for Kagoshima where Mrs. Kato and family live—Ed. *L. of M.*

TRADE & INDUSTRY.

Dairen Trade Returns.

For March, 1921.

Among the foreign imports to Dairen during March, 1921, in the line of cotton fabrics, grey sheeting headed the list, followed by grey shirtings, Japanese Cotton Cloths, twilled cotton cloth, and Japanese Cotton Yarn in the order mentioned.

In the line of metals, tin plates were of the largest quantity, and bar iron comes next.

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Of sundries, new and old gunny bags, cement, cigarettes, electricity materials, American Kerosene oil, railway materials, railway sleepers, rice, etc., are the principal articles.

The following table gives a comparison between March this year and last year :—

	March 1921	March 1920
Grey shirtings	17,050 rolls	55,150 rolls
Twilled cloth	10,647 „	27,356 „
Japanese cotton fabric	11,759 „	28,462 „
Grey sheeting	53,500 „	139,092 „
Japanese Cotton Yarn... ...	3,711 piculs	1,288 piculs
Bar iron	11,397 „	17,051 „
Tin plates	57,689 „	10,965 „
Gunny bags (new)	784,600 pieces	2,290,920 pieces
„ (old)...	35,600 „	123,420 „
Cement...	15,929 piculs	124,623 piculs
Cigarettes	102,490,000 pieces	145,145,000 pieces
Electricity materials	52,767 taels	168,300 taels
American Kerosene oil ...	800,000 gallons	—
Railway materials	170,499 taels	534,570 taels
Railway sleepers	137,046 pieces	94,229 pieces
Rice	37,182 piculs	11,792 piculs
Sugar	20,410 „	23,170 „
Soft wood	90,355 sq. ft.	300,395 sq. ft.

During last March, kerosene oil from America, Japanese Cotton Yarn, tin plates, old gunny bags, railway sleepers, and rice showed more or less increase, but with the other articles a decrease was noticed. The general import returns abruptly decreased.

Speaking of imports from China, the chief articles were Chinese imitation cloth, hens' eggs, wheat flour, and rice. Compared with the corresponding month of the preceding year, every item recorded a falling-off with the sole exception of eggs, as tabulated below :—

Principal Imports.

	March, 1921	March, 1920
Chinese imitation cloth	31,564 rolls	37,820 rolls
Eggs	59,424,000 pieces	36,400,000 pieces
Wheat flour	37,864,000 piculs	47,069,000 piculs
Rice...	31,557 piculs	72,403 pieces

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Next, turning to exports, Bean Cake remained at the head of the list. Next came Beans, Kaoliang, maize, wheat, coal, Bean Oil, etc. The figures for these articles, compared with those for the corresponding month of the preceding year, are as under:—

	March, 1921	March, 1920
Bean Cake	2,321,658 piculs	1,689,554 piculs
Beans	900,945 „	1,192,874 „
Kaoliang	306,871 „	370,800 „
Maize	191,718 „	57,466 „
Wheat	676,651 „	265,018 „
Coal	60,308 tons	43,428 tons
Bean Oil	99,655 piculs	105,033 piculs
Melon-seed	26,919 „	10 764 „
Basil	58,073 „	109,810 „
Tussah silk	11,985 „	833 „

The above shows that, although a decrease in Beans, kaoliang, basil, and Bean Oil from the previous year is noted, the other articles all recorded an increase. In particular, the increase of Bean Cake, wheat, etc., was remarkable.

In short, with the import trade, the general tendency was on the decrease, but with the export trade, there was little difference, and, in a sense, the showings were more favourable.

LATEST LABOUR TARIFF.

At Dairen.

In the district under the jurisdiction of the Dairen Civil Administration the labour wages at the end of March, 1921, varied more or less according to trades. The highest were ¥3.60 per day for a Japanese roofer, ¥3.50 per day for a Japanese mat-refacer, and ¥3.40 per day for a Japanese stone mason and mason. With the Chinese workmen, the highest were ¥2.40, and ¥2.20 for a roofer and a stone mason and mason respectively. The lowest were ¥1.20 and 30 sen per day for a Japanese labourer and a Chinese coolie employed on building work. As to servants, the highest for the Japanese was ¥20 each per month with board, the lowest being ¥6 per month. With Chinese servants, the ordinary wages were 35 sen and 27 sen each for male and female servants.

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The general labour scale was as under:—

	Japanese	Chinese
Farming	¥ 250 per annum	¥ 50 per annum
	¥ 1.50 per day	35 sen per day
Japanese dress-making	1.50 per day	—
Tailors	3.00 "	¥ 2.00 per day
Cobblers	2.50 "	¥ 1.10 "
Hatters	2.00 "	60 sen "
Carpenters	2.80 "	¥ 1.80 "
Masons	3 40 "	2.20 "
Cartwrights	2.50 "	1.10 "
Harness makers	3.00 "	1.80 "
Cabinet makers	3.00 "	1.00 "
Lacquerers	3.00 "	2.00 "
Tinsmiths	3.30 "	1.60 "
Casters	2.50 "	1.50 "
Blacksmiths	2.50 "	1.50 "
Compositors	2.50 "	1.10 "
Lithographers & plate printers	2.50 "	1.10 "
Stone masons	3.20 "	2.20 "
Sawyers	— "	1.00 "
Bricklayers	3.00 "	1.80 "
Roofers	3.60 "	2.40 "
Glaziers	2.00 "	1.60 "
Foremen of earthworkers	2.00 "	1.20 "
Building labourers	1.20 "	30 "
Mat-refacers	3.50 "	1.40 "
Joiners	3.00 "	1.60 "
Day labourers	2.00 "	45 sen "
Coolies	—	45 sen "

MANCHURIA ENLIHGTENING SOCIETY.

Whose Organ the "Light of Manchuria" is.

What actuates us in our endeavours to open up Manchuria and Mongolia lies in realizing our ultimate ideal in the enlightenment and development of Manchuria and Mongolia. It will not do only to develop the natural and industrial resources, but the ethical and intellectual culture of the inhabitants must also be carefully husbanded and nourished, so that both mind and matter may be developed in harmony.

The Manchuria Enlightening Society raised its first cry in order to fill a sorely felt need. Its primary mission is to investigate and propagate the truths of the development of Manchuria and Mongolia. We shall studiously refrain from

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misleading the public by disseminating inaccurate or exaggerated reports, but shall steadfastly adhere to the truth or facts only.

It is urgently important that the truths regarding Manchuria and Mongolia should be made known clearly not only to Japan and China, but also to Europe and America. On this account, the establishment of the Manchuria Englightening Society is bound to have a serious significance of international character.

If happily, through the establishment and activity of this Society, the truths of the development of Manchuria and Mongolia should become topics of world wide interest, it would not be only an honour to those now actively engaged in developing these regions, but also a matter of congratulation to the world at large.

We might be permitted to add that the ultimate ideal and desire of this Society are to serve as the herald of all enlightening movements in future, thereby opening a new chapter in the annals of the world's civilization.

What is the Society Like.

a) Office.—The office of the Society is in the Municipal Office Building on Central Circle in the city of Dairen.

b) Society's Work.—The works of the Society include the following:—

1. Publication of the organ of the Society, The "Light of Manchuria."

2. Supply of general information through the Society and by other means, giving the results of such investigations and researches as may be conducted in the interest of the development of natural, industrial, and other resources in Manchuria, Mongolia, and Eastern Siberia.

3. To act as guide to intending investors in general in all kinds of enterprises in Manchuria, etc., and also to undertake any special investigation or research on application by promoters of all kinds.

4. To offer facility to travellers on inspecting visits to Manchuria, Mongolia, Siberia, Chosen (Korea), China, etc., to the end of importing accurate information and rendering their observations as close to truth as possible.

5. To use all kinds of means in order to propagate the true conditions obtaining in Manchuria, etc., and further to carry on the propaganda work for these regions through the medium of lecture meetings, exhibitions, etc.

6. To compile, publish, sell, and distribute books, pamphlets, etc., bearing on Manchuria and Eastern Siberia.

7. To carry on other works necessary for disseminating information on Manchuria, etc., and also for fostering economic enterprises therein.

c) In carrying on the above work, the Society is divided into the following:—

Secretariate,
Research Department,
Publication Department,
Intelligence Department, and
Accounting Department.

d) Any one wishing to join the Society is requested to send in a written application, giving the name and address, accompanied with the membership fee for not less than three months paid in advance.

e) The membership fee, entitling the member to a copy of the monthly organ, costs 50 sen (½ yen) per month and ¥6 per annum.

Remittances.

All remittances to this Society may be made most conveniently and safely to Transfer Savings No. 2850, Dairen. No receipts for the same will be issued, but instead the Society's monthly organ will be sent.

Officials.

Baron S. Goto (Mayor of Tokyo), President.

Mr. S. Nakanishi (Vice-President, South Manchuria Railway Company), Chairman;

Mr. Y. Aioi (Chairman, Chamber of Commerce, Dairen), Vice-Chairman;

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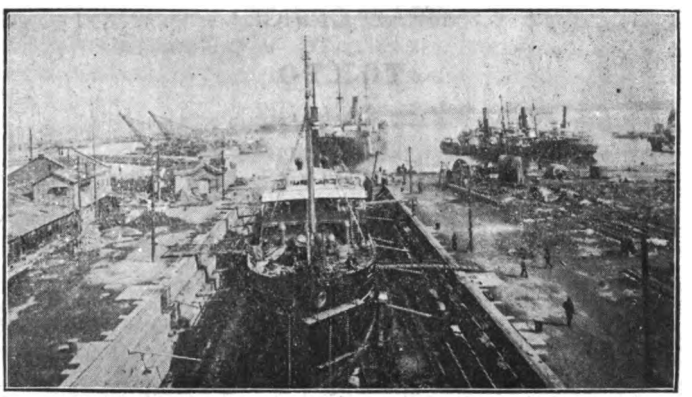

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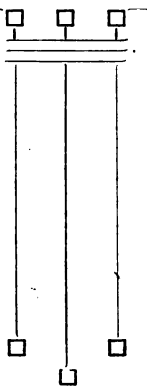

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THE

LIGHT OF MANCHURIA

WILD SERICULTURE IN SOUTH MANCHURIA.

By Mr. M. Miyasaka.

I. Brief History.

How early and just where wild sericulture in South Manchuria originated is difficult to be traced. But, it appears most reliable that, in the Chiaching (嘉慶) Era of the Ching (Manchu) Dynasty, wild sericulture was imported into South Manchuria by immigrants from Shantung to Kaiping (Kaichow), which then carried on the closest communications with Shantung. It occurred to the Chinese local authorities that the hill ranges in the district might be turned to good account by rearing wild silkworms. They offered encouragement, and as a result, this domestic industry became gradually popularized, and many Chinese farmers took it up as a profitable employment for off hours. Others followed their example, and, as the inhabitants increased in number, this employment spread north as far as the hilly country of Kirin Province and as far south as the northern part of the Kwantung Leased Territory. In early times, the wild cocoons harvested were reeled into tussah silk in part by means of a primitive machine often known as the spinning spindle (chientoutzu, 尖頭子), and the rest was exported by Shantung Chinese to Ninghai, Hsihsia, etc., to be reeled by somewhat improved machines, and then to be woven into what was styled "Shantung pongee."

In the early period of the Emperor Kwanghsu, some Germans started at Chefoo the reeling of wild cocoons by what is known as the Kennel system, and a system conceived after the Kennel system, (which may be called also the "plate reeling system") was imported into South Manchuria soon afterwards. It secured in time a foothold in the district about Kaiping, Haicheng, etc., which are populated quite densely. It gained popularity as the population increased in the same district, and at present, there are wild filatures of all grades of dimensions under operation at Siuyen, Antung, Kuantien, Hsifeng, etc., whereabout wild cocoons are harvested.

A number of Chefoo filatures have shifted their plants to Antung and Kaiping from a consideration of business economy, and these two towns in South Manchuria are recognized as the two leading centres for wild sericulture.

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II. Exports of Wild Sericultural Products.

The export amounts of wild sericultural products widely vary according to the crop and demand conditions. However, it may be safe to say that some 80% or so of the whole outputs is for export.

The following gives the export returns for the recent five years:—

	1915	1916	1917
Wild cocoons	244,490 piculs 2,286,718 taels	71,951 piculs 1,519,075 taels	128,842 piculs 1,947,568 taels
Tussah silk fabric	25,916 piculs 4,023,540 taels	13,928 piculs 3,011,564 taels	16,984 piculs 4,596,799 taels
Waste silk	22,986 piculs 982,399 taels	13,741 piculs 582,952 taels	9,241 piculs 377,411 taels
Pierced cocoons	2,996 piculs 73,928 taels	1,112 piculs 11,915 taels	2,475 piculs 122,599 taels
Tussah silk fabric	189 piculs 27,320 taels	157 piculs 26,199 taels	162 piculs 51,990 taels
Total	296,577 piculs 7,393,905 taels	100,889 piculs 5,151,705 taels	157,704 piculs 7,096,367 taels

	1918	1919
Wild cocoons	187,828 piculs 3,035,340 taels	144,570 piculs 2,542,523 taels
Tussah silk	19,358 piculs 5,813,921 taels	24,005 piculs 6,697,294 taels
Waste silk	15,686 piculs 836,127 taels	23,893 piculs 1,208,374 taels
Pierced cocoons	3,952 piculs 50,688 taels	8,734 piculs 163,062 taels
Tussah silk fabric	297 piculs 68,127 taels	438 piculs 157,376 taels
Total	227,121 piculs 9,804,203 taels	202,550 piculs 10,768,628 taels

The export returns for wild cocoons and tussah silk in 1919 were as under:—

From		To Japan	Chosen	China	Total
Antung	Wild cocoons	15 piculs 596 taels	773 piculs 13,259 taels	46,117 piculs 937,919 taels	46,905 piculs 951,774 taels
	Tussah silk	14,995 piculs 4,383,467 taels	17 piculs 4,619 taels	2,465 piculs 710,862 taels	17,477 piculs 5,098,948 taels
Dairen	Wild cocoons	— 71 taels	— —	105,127 piculs 1,671,778 taels	105,127 piculs 1,671,849 taels
	Tussah silk	405 piculs 76,318 taels	— —	3,877 piculs 677,146 taels	4,292 piculs 753,464 taels

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From		Japan	Chosen	China	Total
Newchwang (Yingkou)	Wild cocoons	—	—	1,279 piculs	1,279 piculs
		—	—	81,961 taels	81,961 taels
	Tussah silk	—	—	3,136 piculs	3,136 piculs
		—	—	844,882 taels	844,882 taels
Total	Wild cocoons	15 piculs	773 piculs	152,523 piculs	153,311 piculs
		667 taels	13,259 taels	2,691,658 taels	2,705,584 taels
	Tussah silk	15,400 piculs	17 piculs	9,488 piculs	24,905 piculs
		4,459,785 taels	4,619 taels	2,232,890 taels	6,697,294 taels

Remarks: The exports from Dairen and Newchwang are principally outputs about Kaiping and its neighbourhoods; those from Antung consist of outputs about Antung, Kaiping, and Haicheng.

III. Wild Silkworm Raising.

The wild silkworm is called "Antherea mylitta" and is a bivoltine silkworm. It cocoons twice a year—in spring and autumn. The spring cocoon in response to the instinctive claims of the silkworms gives a thin cocoon unsuited to reeling, but is reared mostly breeding the autumn crop.

a. Sericultural Ground and Feed.

1. Sericultural Ground.

The hillsides, on which the wild silkworm is reared, is called the sericultural ground. It lies, in many cases, on the hillsides and in the gorges, and the sunny side is preferred. The scrub-oak is planted on this ground.

The area unit of the wild silkworm raising ground is known as "pachientzu" (把剪子), the actual dimensions of which are more or less different, consists of about 4,500 *tsubo*, in which from 3,500 to 5,000 scrub oak trees are planted.

2. Feed.

The trees, on the leaves of which the wild silkworms are fed, belong to the oak (Fagaceae) species, of which there are more than a dozen kinds. They may be divided into three kinds, namely, (Polo 橅羅樹), quercus glandulifera, (Chingkung 青杠樹), mallotus philippinensis (Mongolia oak), and (Chientso 尖柞樹) Japanese silkworm oak. Generally, Mongolia oak is used for feeding baby silkworms, and the two other kinds are for after the third moulting.

Recently, the leaves of the populus balsamifera L. var. laurifolia Bet M. (a species of the Salicaceae genus) are being experimented upon with satisfactory

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results in both harvest condition and the quality of cocoon. However, this species has to be planted close to the water, and under this limitation, it does not admit of wide propagation.

b. How to Raise Wild Silkworm.

1. Breeding cocoons.

The breeding cocoons for the autumn crop are selected from among the spring crop raised on one's own sericultural ground. For the spring crop, no silkworm eggs of one's own raising or none raised in one's neighbourhood are used, but what have been put out at great distances are adopted most popularly.

It is perhaps out of the desire to subject the silkworms to natural selection through the difference in the climatic and other conditions.

The breeding moths of excellent quality obtainable from the breeding cocoons are put at about 30% of the number of the cocoons. One moth gives from 90 to 120 silkworm eggs. The incubation rate of the silkworm eggs ranges between 70% and 85%, whilst the cocooning rate is from 20% to 50% of the silkworms hatched. On the above basis of calculation, the breeding cocoons required for one sericultural ground of 4,500 *tsubo* are between 4,500 and 5,500 grains.

2. Spring crop.

Fine cocoons obtained from the autumn crop of the preceding year are put in baskets made of willow sprigs, and the baskets are left suspended in a room, in which a certain degree of temperature is preserved. Moths will come out of the cocoons about the middle of April and will lay eggs. These eggs are hatched in about ten days. The larvae are fed on chopped young leaves in the farm yard till the second moult is past. Then the silkworms are taken out to the sericultural ground for natural feeding. At the same time, the raisers put up watch-sheds in the ground, and men are kept therein to attend to the removal of the undergrowth and foreign trees, the extermination of ravenous birds and insects, the removal of the silkworms from the bared trees to the virgin ones. In about fifty days, that is, by the latter part of June, the silkworms begin cocooning, which process will be completed generally in about a week, and then the cocoons are to be gathered by hand.

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3. Autumn Crop.

When fine cocoons selected from among the spring crop are kept still in a room, they will turn to moths about the middle of July. The she-moths may be separated from the he-moths in about a day. The wings of the mother moths may be tied to the stems of the scrub oak trees so that the eggs may be laid on the barque. In ten days or so, the eggs will be hatched, and the larvae will climb up the stems after the leaves to feed on. The silkworms are cared for in the same manner as the spring crop. In about forty days after hatching, the cocooning process will be started and will be finished by early in October.

The above is the progress of wild silkworm raising in an average year about Kaiping (often referred to as Kaichow) just south of Tashihchiao Junction on the main line of the South Manchuria Railway Company Manchuria Line. More or less advance or delay in time should be allowed according to the weather and feed conditions.

c. Harvests.

With all the vigil and care exercised by the experienced raisers on the sericultural ground, no little havoc is wrought among the silkworms by the weather, diseases, insects, and birds, because of the feeding ground being in the open and exposed. In such circumstances, no accurate statistics is obtainable, but according to the raisers, the harvests on a feeding ground of 4,500 *tsubo* are estimated as follow :—

Average crop	...	...	...	...	55,000– 60,000	grains	of	wild cocoons
Bumper „	...	...	...	...	80,000–100,000	„		„
Poor „	...	...	...	...	20,000– 40,000	„		„

In off years, the crop is utterly ruined, whilst, in lucky years, the limit of 100,000 grains is even exceeded.

d. Economic Side of Wild Sericulture.

Wild sericulture has not risen above being only a bye-industry to the farming household. And yet, about Kaiping (Kaichow), Hsiuyen, Kuantien, etc., which are the greatest centres for this line of industry and have a comparatively small area of land under cultivation, wild sericulture seems to occupy quite an important place as a source of income. But, as to the actual figures of earnings and expenses,

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the statements given by the parties directly interested are at a wide variation. The following is given as approximately reliable data for 1 pachientzu of feeding ground (being 4,500 *tsubo* in area):—

Earnings.

	grains	Per 1,000 grains	Value
Good cocoons...	49,500	@¥3.60	S.¥178.20 in Fengtien notes (silver
Stained cocoons	5,500	1.40	7.70 ,,
Pierced cocoons	5,000	2.00	10.00 ,,
Sundry receipts	—	—	2.00 Sprigs sold for fuel
Total	—	—	197.90

Expenses.

		Per 1,000 grains	Value	
Breeding cocoons...	5,000 grains	S.¥8.00	S.¥40.00	Fengtien notes (silver)
Coolie hire	140 men	30 sen a day	42.00	Each man counted as the same number of days he is employed
Coolie feed	140 ,,	12 ,,	16.80	
Tax on feeding ground.	—	—	1.10	
Rent for feeding ground.	—	—	22.00	according to harvest condition.
Sundries	—	—	5.00	sericultural requisites, gun powder, etc.
Total	—	—	126.90	
Net profit	—	—	71.00	

The above is given as the actual returns for the autumn of 1920.

Then, comparing the returns for one "pachientzu" (4,500 *tsubo*) with those for more than one used as feeding ground, in the latter case, some saving may be effected in the expense account, but the harvest rate must be reduced, so much being taken off the profit.

e. Producing Centres and Outputs.

1. Producing Centres.

Wild cocoons may be put out on any hillsides in South Manchuria, but the districts about Kaiping, Siuyen, Antung, and Kuantien are acknowledged as the best known producing centres. Such Prefectures as Haicheng, Liaoyang, Fenghuangcheng, and Fuchou come after them. The following gives a list of places where wild sericulture thrives most:—

1. **In Kaiping Prefecture:**
   Panshanchai, Shihmenling, Hsienchiaku, *Wanfuhsiang, Chipanling, Yunshankou, Tiaoyutai, and Chiehkuanting.

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2. In Hsiuyen Prefecture:
Yangmukou, *Wutaokou, Imienshan, Tahuling, Weichialing, *Paichiaputzu, Tafangshen, and Lankuanling.

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3. In Antung Prefecture:
Wulungpei, *Tahoan, Takuhsiangtzu, Chiupanshih, Chuanshuihu, Tapingshan, Hungshihlitzu, and Lungchuankou.

4. In Kuantien Prefecture:
*Changtien, *Yungtien, Hotien, Hsiaopushihho, Nanhuangkou, *Tapushih, Paitsaiti, Anpingtan, and Shoupitien.

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5 In Haicheng Prefecture:
Anchiakukou, *Litzuyuan, *Tomucheng, Yintzuku, Chuhungku, Huahungku, Sanchiaoshan, and Hsiaokushan.

6. In Liaoyang Prefecture:
Liuchangchou, *Chienfossu, Changkou, Heishanpei, Kutungku, *Laomukou, Tatzuling, and Talienho.

7. In Fenghuang Prefecture:
*Tangshancheng, Anpingho, *Tsaohokou, *Chikuanshan, Lintungkou, *Tungyuanpu, and *Chinmuchuang.

8. In Fuhsien Prefecture:
Telissu, *Sungshu, *Wanchialing, Tashihtsao, *Chienchangkou, Taolungpei, and Chienshankou.

2. Outputs.

No authentic data are in existence as to the outputs of wild cocoons.

According to the writer's calculations on the bases of tussah silk yarn, wild cocoons, tussah silk fabric, waste cocoons, the tussah silk yarn destined to Honan Province by parcel post, what is consumed in Manchuria as material for handicraft work, fabrics, etc., the following is thought to be approximately correct:—

	Wild cocoons grains	Tussah silk yarn	Tussah silk fabric	Waste cocoons	Tussah silk yarn sent to Honan by parcelpost
1915	2,080,760	5,183,200	47,250	359,520	381,500
1916	612,340	2,785,600	39,250	133,440	217,500
1917	1,096,500	3,396,800	40,750	207,000	255,000
1918	1,600,000	3,871,600	74,250	474,240	282,500
1919	1,230,400	4,981,400	109,500	1,048,070	375,000
Average ...	1,324,000	4,043,710	62,200	4,624,560	302,500

	Consumed as handicraft material in South Manchuria	Total
1915	2,564,090	10,617,320
1916	1,255,340	5,043,470
1917	1,522,840	6,608,890
1918	1,740,540	9,043,130
1919	1,496,520	8,240,890
Average ...	1,715,860	7,910,730

There is still plenty of land area available for sericultural grounds everywhere in Manchuria; then there is a tendency on the part of the wild sericulturists to carry on the industry no longer as a bye industry, but as the principal industry; moreover the Chinese authorities about the producing centres are encouraging this enterprise by reducing the tax on the wild sericultural grounds.

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f. Business in Wild Cocoons and Trade Practices.

1. Movement of stocks.

The season of the movement of stocks varies more or less according to the districts, but it opens generally early in October and closes in April or May following. The height of the season lasts from November to the ensuing January.

2. Trade centres.

Antung is the foremost market, but every producing district has its own distribution centre or market.

3. Trade practices.

There is a variety of trade practices. What are now in vogue are

(1) Filature agents buy stocks in person at the producing centres.

(2) Filature agents, accompanied by cocoon brokers at the distribution centres, go to the producing centres to buy.

(3) Purchase of stocks entrusted to cocoon brokers at the distibution centres or markets to sell.

By (1), the buyer enjoys a freedom of choosing such goods as suit his fancy, and may also economize the purchasing expenses. On the other hand, it will be difficult to buy in a large quantity in a short space of time. Besides, the carrying-about of cash money is attended with risks, especially in the rural districts of Manchuria, often infested with brigandage.

By (2), the filature agents may choose such stocks as may please themselves and quote the prices they may care to name. Then, the brokers accompanying them may be asked to take delivery of the goods as bargained for and to look after their transportation. The dealers are entitled to a commission of say, 2% for their services. This practice is thought the safest and best.

By (3), the buyer will have to pay the brokers the 2% commission in addition to the sundry costs borne by the producers or owners because of entrusting the stocks to the custody of the dealers, such as the interest on the advances handed to the owners, the storage fee, etc. These will make the prices dearer than at the producing centres. Still, it is not without its own advantages. Firstly, the quality and quantity of the goods to be bought may be regulated according to the market and demand conditions which are always subject to

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variation from one cause or another. Secondly, Whatever amount of stock may be wanted may be obtained. Most of the filatures located near the markets have recourse to this practice.

4. Trade customs.

(1) Quantity unit; 1000 grains.

(2) Standard currency; Tael at Antung, and Fengtien (Mukden) notes elsewhere.

(3) Delivery of goods is effected against cash payment unless some special business relation exists between the seller and the buyer.

(4) In case of a small stock, the cocoons are counted one by one; in case of a large stock, 5,000 grains or 10,000 grains are counted and weighed, and the remainder is calculated on this basis.

(5) In either case of calculation, 10 grains are added to every 1,000 grains delivered.

(6) The cost of counting and weighing, together with the cost of packing, are borne by the buyer.

3. Packing.

Wild cocoons are packed in large baskets made of willow sprigs, and the baskets are bound tight with hemp ropes. When the goods are for transportation over a great distance, a small bundles of Kaoliang stalks are put in the middle of each basket so as to prevent the contents from getting fomented and stained.

IV. Reeling of Wild Cocoons.

In reeling wild cocoons, large and small hanks are used. Large hanks are principally used about the places where wild cocoons are raised either as a household bye-industry or at a reeling factory built on a very small scale. With the increase of demand for wild silk yarn reeled with small hanks, the use of large hanks is gradually declining.

Besides, the working system by the use of large hanks is much the same as that by the use of small hanks. Therefore, nothing more is said about the former.

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a) Factory.

Wild tussah filatures are organized in a more or less varying fashion according to places and the scales of filatures. But they are mostly formed on a limited partnership basis and are managed by a works manager with an assistant works manager.

For reference sake, particulars of a filature about Kaiping (Kaichow) employing 200 hands, with its capital, both fixed and working, employees, etc., are as follow :—

1. Capital Required.

		In Chinese small silver coins.
Fixed Capital.		
Site for filature and storing ground for materials ... ... (500 *tsubo* @ S.¥5 per *tsubo*).		S.¥2,500
Buildings :		
Office		
Filature (used also as dormitory)	200	
Finishing room	800	
Drying room	510	
Cocoon boiling room	800	
Yarn-end finding room	300	
Store-room	700	
Kitchen...	450	
	S.¥9,360	9,360
Machines, etc.		
Reeling machines (250)	S.¥1,540	
Cocoon boiling kettles (30)	1,200	
Packing appliances	120	
Office furniture and fixtures	60	
Kitchen utensils, etc.	150	
Sundry articles needed	500	
	3,570	3,570
Total		S.¥15,430
Working Captial.		
42,340,000 grains wild cocoons as materials for use from October to May following		S.¥126,700
Working expenses including labour wages, pays for staff, interest, etc. ..		60,000
		S.¥186,700
Grand Total...		S.¥202,130

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However, as to the working capital, the proceeds of the manufactures may be utilized, so only one-quarter or even one-sixth of the above mentioned sum will prove sufficient for the purpose.

2. Filature Staff and Work hands.

Works Manager	one	300.00	Entitled to 10% share of net profit.
Asst. works manager	one	200.00	„ 6% „
Trade clerks: (buyers of raw materials; sellers of manufactures).	two	200.00	„ 4% „
Clerks	two	400.00	one entitled to S.Y230 as bonus othe „ 170
Examiners	two	400.00	one „ 250 „ other „ 150 „
Finishers	three	780.00	one „ 300 „ other two „ 240 each as bonus
Cocoon handlers taking delivery of same	two	100.00	each „ 50 bonus
Foremen	two	260.00	each „ 130 „
Cocoon boilers	four	800.00	one „ 250 „
			another „ 250 „
			other two „ 125 each bonus
Yarn-end finders	ten	1,000.00	one „ 150 bonus
			another „ 130 „
			other 8 „ 90 each bonus
Cooks	two	200.00	one „ 120 bonus
			other „ 80 „
Night watchman	one	80.00	
Water-drawers	two	160.00	each entitled to S.Y80 bonus
General help	fourteen	840.00	„ 60 „
Reeling hands	220	Paid according to work done (20 men extra kept to take the place of the absentees).	
Total	268		

3. Filature Fquipments.

(1). Drying room. With a suitable length of frontage, about 8 ft. deep, and 16 ft. high, the floor to be heated with a "kang" (as the oven is heated). Shelves are made one over another at an interval of from 1 ft. 2 ft. above the heated floor.

(2). Store-room for raw materials. Raw wild cocoons are kept in the large baskets in the yard. But as to dried cocoons, they are kept in a wooden-built store-shed. Couple of bars are fitted to the walls across the shed a few feet above the ground. Mats woven of the husk of

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kaoliang stalks are then put on the bars athwart, and cocoons are kept on these mats.

(3). Reeling room. It has a suitable frontage, 16 ft. deep and 12 ft. high. It is built of brick. In the centre the cocoon boiling kettle is installed, and on both sides thereof the reelers work. There is a passage, 5 ft. wide, through the middle of the room. On either side of the passage way, the floor is raised two feet and is heated with the *kang*. Reeling plates, which are worked by the foot, are put at the interval of 3 ft. Why the boiling kettle is installed in the centre of the room is from the desire to lead the heat rising from the fire underneath the raised floors on both sides of the passage, so as to get the reeled tussah silk dried. It may be added that the reelers sleep on the heated floors at night.

(4). Cocoon boiling room. Besides the cocoon boiling kettle installed in the centre, similar kettles are installed in a brick building of a suitable frontage, a depth of about 24 ft., and a height of 12 ft. These kettles are installed on both sides of the passage also running through the middle of the room. One kettle is for every ten reelers.

(5). Tussah silk drying room. A separate brick building is provided, being 8 ft. deep and 12 ft. high with a suitable frontage. The raised floor therein is heated like the reeling room. Wooden bars are laid across the room and the tussah silk on the hanks are put on the bars.

No remarks are made on the office, kitchen, store-room, etc., as no special arrangements are made therefor.

b. Reeling Methods.

1. Kinds of reeling methods.

There are, as stated above, two reeling methods, one by the large hank and the other by the small hank.

The large hank is four-cornered and measures from 5½ ft. to 7 ft. in periphery.

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The small hank is hexagonal or six-cornered, measuring 4 ft. 11 in. in periphery.

Then, speaking of the different kinds of wild cocoons, both large and small hanks are used with the spring cocoons and also the autumn cocoons.

WILD SILKWORMS FEEDING ON SCRUB-OAK LEAVES.

For the pieced cocoons of both spring and autumn crops, the large hank is principally used. Next, for the stained cocoons of the two different crops, both kinds of hanks are used.

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Most of tussah silk put out is from the autumn crop, as may be seen from the undermentioned which give the percentages of what is put on the market annually :—

Autumn crop (by small hank)	50%
„ (by large hank)...	32%
Spring crop (inclusive of pierced cocoons) by both small and large hanks.	11.5%
Autumn pierce cocoons (by both small and large hanks)	5.%

Besides, hand-reeling instruments known as "Chientoutzu" are used, but their number is inconsiderable.

Of all kinds of tussah silk, the most promising is what is reeled from the autumn crop by small hanks.

2. Reeling Process.

(1) Wild cocoons (used as raw material).

Quality: Wild cocoons are usually of a rather prolonged oval shape, and of ashy brownish colour. 1 Japanese *sho* (a cubic measure being 1/100 of 1 *koku*) may hold 90 to 100 grains. Raw cocoons immediately after the harvest weigh about 140 or 160 *momme* (1 1/6 lb. or 1 1/3 lb.) per *sho*.

The following is the weights, etc., of the different parts of ordinary wild cocoons in 1 *sho* :—

Contents of 1 *sho*	90–100 grains
Gross weight „	140–160 *momme*
Cocoon floss	1.6–2.1 „
Cocoon fibre	14–16 „
Pupa, etc.	124.4–141.9 „

The length of silk contained in one grain of cocoon ranges between 530 and 800 metres. The size of silk is from 2.7 to 4.6 deniers, the difference in size being put at 1.0 to 2.7 deniers. The tension of 1 denier is from 3.4 to 5.0 grams. Its elasticity is between 17% to 29%.

Selection of cocoons:

The selection of cocoons so as to ensure the uniformity in quality of the silk reeled is most essential. It is one of the trade practices to remove all stained and other inferior kinds of cocoons before delivery to the buyer on the market, but generally only the unpresentable kinds are taken off, and on this account, the cocoons must be selected before being prepared for reeling.

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The raw wild cocoons on the market usually consist of 51% of first grade, 38% of second grade, and 11% of inferior kind.

The filatures, on the purchase of cocoons, assort them into two kinds—fine and inferior.

Pupae killing, drying of cocoons, and storage :

Hitherto, the reeling of wild cocoons was commenced immediately after the autumn harvest time and was continued till the following March or April. What is used for reeling purposes after April, used to be exposed to the cold at the depth of winter so as to kill the pupae by freezing. Such a primitive way of treating wild cocoons was found to be attended with the appearance of many stained cocoons as the period of storage was protracted, resulting in considerable loss. Therefore, almost every new filature provides itself with a cocoon drying equipment and kills the pupae by the use of this equipment before the return of spring. However, this drying device is quite primitive and is to keep the wild cocoons in the cocoon drying room above mentioned and to have the temperature of the room raised in the meanwhile, it being only slightly superior to the exposure of the cocoons to the wintry cold.

As regards the storage of the cocoons, raw cocoons are kept in the yard in the large baskets in which they are packed and these baskets are covered with mats on the top. Or else, low shelves are made, and on these shelves the cocoons are spread and are covered with mats. About once a month, the cocoons are exposed to the sun.

With dried cocoons, they are kept in the cocoon store-room.

(2). Boiled cocoons.

Wild cocoons contain in the cocoon fibre much impurity in the form of lime, albumen, resin, etc. On this account, they are difficult of reeling by simply boiling them like ordinary cocoons. Hitherto wild cocoons have been boiled in a thick solution of sodium carbonate, which is applied according to the following method :—

Boil in the cocoon boiling kettle about 12 gallons of water. Put 400 or 500 *momme* of (Kouchen [illegible]), a sort of sodium carbonate, at the ratio of about 40 *momme* to 1,000 grains of wild cocoons. As the water gets boiled, put 10,000 or 12,000 grains of wild cocoons. Keep the cocoons stirred, and raise the temperature

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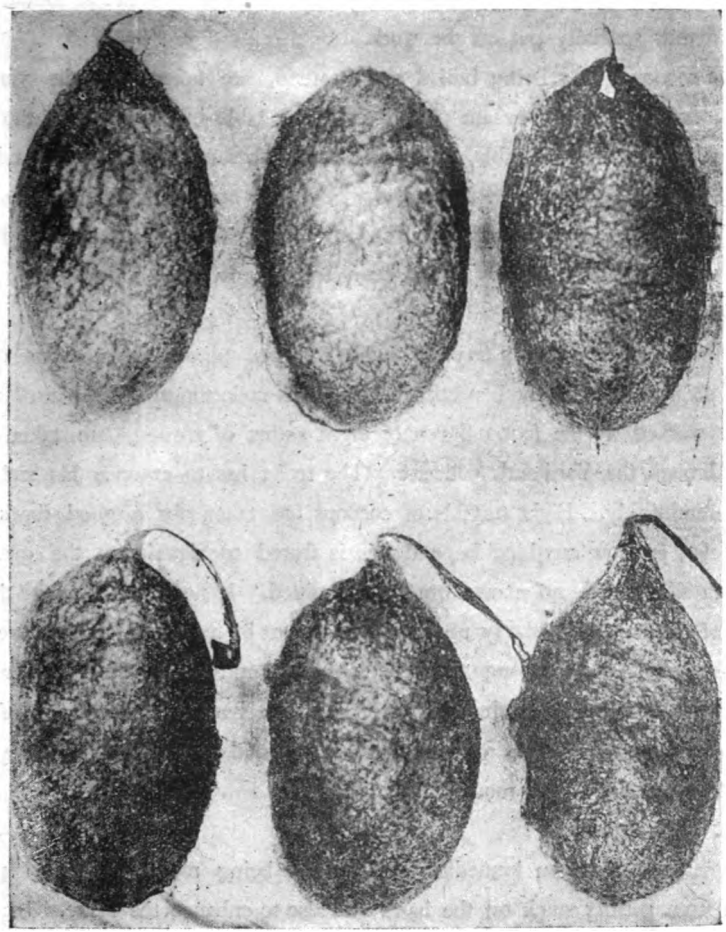
of the water. As soon as the water has entered into the cocoon fibre, the cocoons are taken out of the water and are put in baskets made of williow sprigs, to allow the water to drip off. At the same time, the water in the kettle is dipped out and about 12 gallons of fresh water is put in instead. Then, bars are placed



WILD COCOONS.

just over the water and the basket containing the cocoons is placed on the bars. Next, the cocoons are steamed for four hours. Then, pour boiling water over the cocoons to wash off the soiled water, and then the cocoons are subjected to

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another steaming process lasting for four hours. Again, hot water is poured over the coccons in a rather liberal quantity, and then they are placed under a pressing machine to squeeze out the dirty water.

(3). Yarn-end finding.

In wild sericulture, the right end of yarn for each cocoon is found by a gang of hands specially put on the work.

The cocoons, after being boiled and steamed, are taken into the yarn-end-finding room, in which they are placed on a low table in the centre of the room. The gang sits around the table, and each hand takes off the floss around each grain of cocoon and finds the Yarn end. Such cocoons are handed to the reelers against cocoon tickets on wooden trays, each bearing from 100 to 120 grains.

A yarn-end-finder can dispose of from 130 to 160 trays a day.

(4). Reeling.

A reeler, as he receives trays of wild cocoons, places the cocoons on the wooden shelf made directly beneath the Yarn-ends collector of the "plate" reeling machine worked by the foot. Seven or eight grains of cocoons are taken up at a time through the Yard-ends collector. The reeler has to exercise his sight and hand unremittingly. Eight trayfuls of cocoons are taken for a good day's work for a reeler, and, as anything beyond this is feared to deteriorate the quality of the tussah silk reeled, no excess work is permitted. It need not be said that the quality of silk depends largely upon skill in the art of reeling. Each filature keeps foremen selected from among the reeling hands, and make them supervise the reeling work. When a certain amount of silk has been reeled, a slip of paper bearing the number of each working hand is fastened to the hank and the hanks are sent to the silk-drying room.

(5). Silk-drying.

Tussah-silk needs an immediate drying after being reeled so as to prevent the silk from getting stuck on the hank and also to enhance the lustre. In drying the silk, it is piled up on the hanks in the shape of what is generally called in Japan as that of a tortoise shell, in the silk-drying room. The room is then heated for an hour or two, then the windows and doors are thrown open, and the silk is left undisturbed for a few hours. Then the silk is taken off the hank, and is then sent to the silk inspection room.

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(6). Silk inspection.

In the silk inspection room, the silk is graduated into 1st, 2nd, and 3rd classes, and then is passed over to the finishing room.

A reeler, whose work is graduated to be of 3rd class or still poorer, will be called to the presence of the officials who will then point out the defects by way of warning. In the worst cases, the men will be disciplined according to the regulations of the filature.

(7). Finishing.

In the finishing room, each hank of silk is made into one twist, and 85 or 95 twists of silk make up one package of 5 *kin* and are put in a wooden box.

(8). Packing.

A large wooden box is made sufficiently large to hold 100 *kin* of silk. Over the wooden box, paper is pasted, and in order to keep off the moisture, a preparation made with a mixture of hog's blood and lime is applied on the paper. Oil paper is then laid inside the box, and then 100 *kin* of silk is put in. Next. the box is hermetically sealed, and then is bound tight with hemp ropes.

(9). Reelers and other working hands.

Reelers are boys and men ranging in age from 15 years to 30 years. Until a few years ago, when reeling by small hanks began to be popular in Manchuria, the filatures always met with difficulty in recruiting the necessary number of working hands. They sent their agents to Chefoo to enroll the necessary men. Recently, with the decline of the wild filatures at Chefoo, the workmen are immigrating into Manchuria in quest of employment. Moreover, as natives of Manchuria become better acquainted with the reeling of silk by small hanks, good men can be secured more easily.

The same thing may be said of cocoon boilers, silk inspectors, etc.

The reelers are paid according to the results of their work. But usually, a man's monthly wages are about S.¥10 in Fengtien (Mukden) notes, with board supplied by the employer.

(10). Management.

Everything may be said to depend on management. The primary thing is to secure the services of a good and capable manager. In most cases, experienced men, who have been on friendly terms with the employers for long years, are

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engaged as works manager, under whom men are kept in charge of each section of the filature.

Functions of Employees.

For reference sake, the regulations concerning the employees of a small-hank wild filature at Kaiping are translated in substance under:—

1. Works manager and assistant works manager shall supervise all the work without unfair discrimination and favouritism.

2. Clerks shall enter all details on the books. Honesty shall guide all transactions in money and other matters.

3. The reputation of the filature depends upon the silk inspectors. Any reeler turning out silk of inferior quality shall be strictly disciplined.

4. Foremen shall undertake to maintain order and quiet in the filature.

5. Cocoon-boilers shall be careful about the amount of sodium carbonate to be used, for a good deal of the working efficiency and the silk outputs depends on their skill.

6. Yarn-end-finders shall take care to put out as little waste silk as possible.

7. Finishers shall be careful to twist and pack in a uniform fashion.

8. General workmen shall work faithfully under the directions of their superiors.

9. Reelers shall perform their task in observance of the following regulations:

Regulations Governing Reelers.

1) Each filature shall pay its working hands according to the tariff determined by the Chinese Guild, and shall pay no higher wages.

2) The daily work assigned to a reeler shall be eight hanks.

3) Beginners shall be put on trial work for three days, to be either hired or sent away, according to the result of the trial work.

4) When a reeler resigns before his working results reach 240 hanks, only half the stipulated wages shall be paid.

5) A reeler, who has worked unremittingly for thirty days at the working efficiency of 8 hanks a day, shall receive a reward.

6) Wages for reeling one hank are fixed at 4 sen silver in Fengtien notes.

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7) An average showing shall be computed from the total results of the reelers for every ten days. Those whose showing is above the average shall be rewarded at the rate of 2 sen per *momme*, whilst others whose showing is below the average shall have to pay 2 sen as forfeit for every *momme* below the average. When the showing for every ten days is less than 76 hanks, no reward shall be given even if it be above the average, although the forfeit shall have to be paid for every *momme* below the average.

8) When any reeler puts out yarn having burls, does not tie a yarn end cut off, or turns out a yarn of different deniers and hanks of yarn of varying quantities, a forfeit of 20 sen per hank shall be imposed. When the same offence is repeated three times, the offender shall be discharged at once.

9) When a reeler does not care to remain in employ, he shall leave the service alone. Any loss, if caused to the filature by enticing other reelers from employ or by plotting a strike of the men or a like trouble, shall be made good by the agitator through the intervention of the authorities.

10) The denier of yarn shall be regulated by reeling from eight grains at a time. For any excess or shortage in the number of grains, a forfeit of 10 sen per grain shall be imposed.

11) When a reeler has damaged the hank through his fault, a forfeit of 30 sen shall be paid.

12) When a reeler has lost initial waste silk and non-initial waste silk (vide V. Byeproducts and Pierced cocoons), forfeits of 20 sen and 30 sen respectively shall be collected. One who has not taken off any part of the boiled pupae fastened to the yarn shall be forfeited 50 sen.

13) When a reeler has lost the hank cloth under his custody, he shall be forfeited 50 sen. The loss of the cocoon card or the lamp shall be made good by the payment of 30 sen each.

14) Any gambling or brawl in the filature shall be punished by an instant dismissal.

15) When any reeler called from Shantung on payment of travelling expenses by the filature asks for a release within six months for his personal reasons, the travelling expenses advanced to him shall be deducted from his wages, and, in case

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of the wages being short of the amount, an equivalent therefor shall be realized on his personal effects.

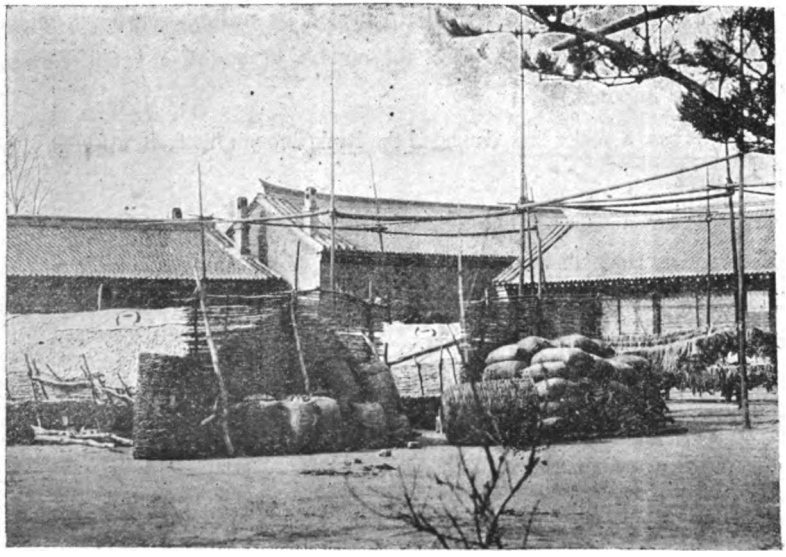
16) When a reeler wishes to pass the Chinese New Year holidays at the filature, he shall pay ¥3 for board.

17) An apprentice shall be paid ¥40 for a three years' term. When he leaves the filature either within the term of apprenticeship or immediately after the expiry of the term, S.¥30 shall be charged for each year as training expenses.

18) Any one objecting to any of the above regulations shall leave the filature at once.

c) Receipts and Expenses.

With an industry like wild silk manufacturing, which has its outputs exposed to a wide range of market fluctuations, it is oftener the market conditions than the management of the enterprise that decides the outcome. Therefore, how it has come out can hardly be told in many cases before the showings of several successive



INTERIOR YARD OF FILATURE (View 1).

years are reckoned. The Chinese filatures have been settling their accounts usually at least every three to five years.

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For reference sake, an instance, in which wild cocoons were purchased and reeled, and the outputs were sold to Japan, in January, 1921, at Kaiping (Kaichow), may be given in details.

The following is a table of the actual outlays and receipts in Fengtien notes per 100 kin of tussah silk:—

OUTLAYS.

Wild cocoons (206,200 grains) (@ S.¥2.64 per 1,000)	S.¥544 37
Labour wages for 1,874 hanks @ 4 sen per hank	74.96
Pays for other employees	15 06
Board for reelers, etc., 2,708 men @ 28 sen each per day	75.60
Fuel (2,800 *kin* coal) @ ¥2.10 per 100 *kin*	60.48
Chemicals, etc., 80 *kin* sodium carbonate @ ¥10 per 100 *kin*	8.00
Kerosene oil (2 tins)	10.50
For finishing process	1.50
House rent and interest	2.10
Sundries...	4.15
	S.¥796.72

RECEIPTS.

Proceeds from sale of tussah silk (100 *kin*)	S.¥7.30
Proceeds from sale of waste silk (76 *kin*)	93.70
Proceeds from sale of pupae for food (620 *kin* @ 2 sen, per *kin*)	12.40
Sundries (5 empty baskets @ 45 sen each)	2.25
	S.¥838.35

Net profit: S.¥41.63

d) Producing Centres and Outputs.

Wherever wild cocoons are produced, there are small filatures of varying dimensions.

Here, the data for Antung and Kaiping, the two most principal centres, are given, and the outputs of the other places are included in those of the two chief distribution centres.

1. Antung.

In 1904, Taotai Chien of Antung founded a small filature employing 200 reelers at the base of Yuanpaoshan Hill on a capital supplied by himself. It was the first plant of this nature at Antung, and from this originated the wild sericultural

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industry there. It was subject to an undulation of ups and downs, notwithstanding, it has been growing more or less year after year.

Especially since 1914, many filatures of Chefoo, seeing that they can work a plant at a smaller outlay at Antung than at Chefoo, have opened new filatures at Antung, whilst some Chinese businessmen of means have established filatures on an extensive scale at Antung. Thus, this industry has taken long strides forward, and now Antung stands peerless as the producing centre for tussah silk and also as the market for its distribution.

The following is the table of the leading filatures, together with their outputs :—

	Brands of outputs	No. of reeling machines	Monthly outputs	Remarks
Hsingtung Kungsu	Golden Star	300	unknown	Under Japanese management
Tasheng Filature	Fan	140	„	„
Chengchi „	Golden First Star	1,200	180 boxes	A box containing 800 *kin* of wild silk
Yenchi „	Scrub Oak	510	75 „	
Chiensheng „	Dragon Fly	500	75 „	
Wenchi „	Signboard	600	90 „	
Yifutai „	Peony	650	—	
Tungchangshun	Golden Landscape	480	70 „	
Shihyeh Filature	Jewelled Crown	520	75 „	
Tungtai „	Eight Sages	600	90 „	
Fuite „	Wild Silkworms	500	75 „	
Yichang „	Double Elephant	700	105 „	
Hsingchi „	Wasp & Flying Bear	510	75 „	
Taichi „	Grazing Cow, God of Felicity, & Double Dragon	200	35 „	
Yanchitung	Scrub Oak	450	65 „	
Yihsingte Filature	Tree of Wealth	200	30 „	
Shengchi „	Chrysanthemums	300	35 „	
Hofeng „	Child of Wealth	250	35 „	
Junshengho	Golden Dragon & Silver Dragon	130	20 „	
Tungchang Filature	Fairy Peach	130	20 „	
Tunghosheng	Lotus Flower	350	45 „	
Tehohsiang	Treasure Ship	350	45 „	
Chenghochang	Flying Bear	650	100 „	
Hohsiang Filature	Motor Car	80	10 „	
Yuchi „	Cock's Comb	400	60 „	
Fuchangho	Hawk Flag	500	75 „	
	Total	**11,250**	**1,585 boxes.**	

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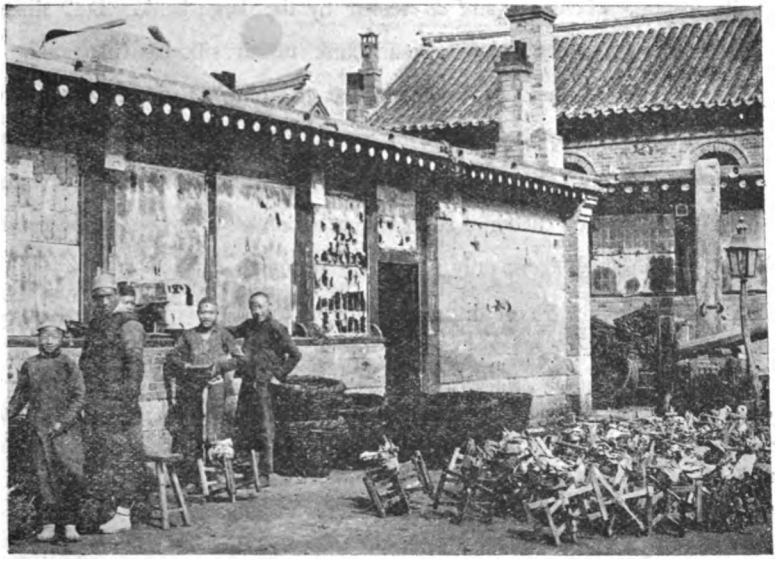

INTERIOR YARD OF WILD FILATURE (View 2).

The number of working days of a filature varies according to the cocoon crop and market conditions, but generally the working season lasts from early October to the following June, extending over about two hundred days. The tussah silk put out and distributed at Antung from 1915 to 1919 are as under:—

	By		Total piculs	Remarks
	Small hank	Large hank		
1915...	—	—	8,988	Difficult to classify into small and large hanks.
1916...	—	—	4,538	
1917...	—	—	5,008	
1918...	2,224	6,833	9,057	
1919...	3,896	13,581	17,477	
Average	—	—	9,013	

2. Kaiping.

The wild filature industry at Kaiping had its origin in the import from Shantung of the method of reeling tussah silk by means of the plate reeling machine in the early years of Kwanghsu Era (under the reign of the last Manchu Emperor), that is, about forty years ago. Kaiping was known for years as the

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tussah silk centre, where the silk is reeled by the large hank. But, since the great World War, the demand for small hank tussah silk has increased. The Hengshengte (one of the Chinese plants at Kaiping) took the initiative in converting his plant into the small hank system. This example was followed by the others with alacrity. From about 1918, a number of Chefoo manufacturers have been founding new filatures at Kaiping and now it is the largest centre for tussah silk by the small hank only second to Antung.

The following is a list of the chief filatures, together with their outputs:—

	Brands of outputs	No. of reeling Machines	Monthly outputs	Remarks
Changchi Filature	Flying Fountain Dragon	500	75 boxes of silk	250 machines
Liyuanchang	,,	500	75 ,,	(Large hank)
Tateheng	Double Bird	200	30 ,,	,,
Hengshengte	The Globe	300	45 ,,	
Shunchi	Banana Tree	400	60 ,,	
Shunchangte	Pine & Deer	200	30 ,,	
Chienshengli	Double Deer	150	20 ,,	
Tientsengta	Sunlight	150	25 ,,	
Yungfengte	Landscape	200	30 ,,	
Sheng Filature	Silkworms	200	30 ,,	
Yuchangta	Lone Flower	200	30 ,,	
Tehsinghai	Steamship	100	15 ,,	
Chushengkung	Reed & Wild Goose	100	15 ,,	
Yuchangyung	Double Phoenix	100	15 ,,	
Yungtechang	Incense Burner	100	15 ,,	
Yunghochan	Giraffe	200	30 ,,	
Kungshuncheng	Lion	200	30 ,,	
	Total	3,800	570	

In addition, there are 11 plants which have no brands for their manufactures, and put out amongst them roughly 120 boxes of tussah silk by the use of 1,250 reeling machines.

The working season begins early in October and lasts till the ensuing June extending over about 200 days as it is at Antung.

The outputs and distribution amounts for five years from 1915 to 1919 are as under:—

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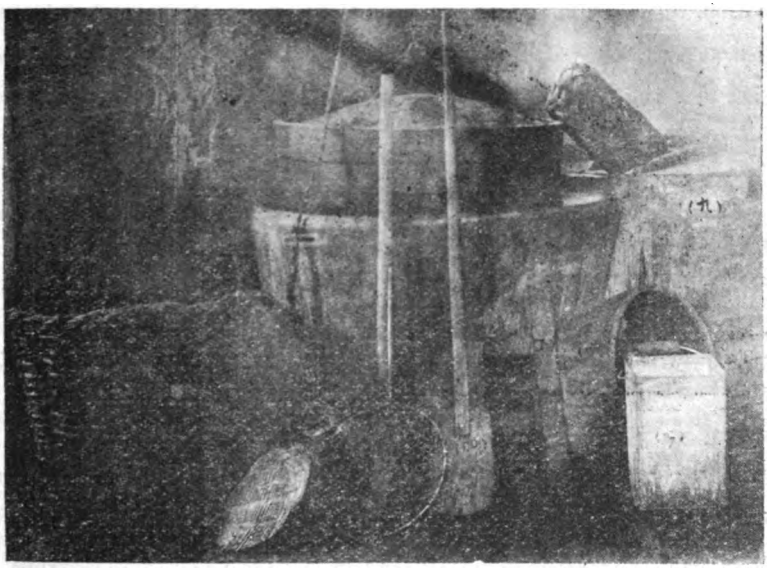
	By		
	Small hank	Large hank	Total
1915...	8,960 piculs	8,589 piculs	17,549 picul
1916...	1,251 „	8,131 „	9,382 „
1917...	3,283 „	8,693 „	11,976 „
1918.	3,885 „	6,415 „	10,300 „
1919...	2,882 „	4,548 „	7,430 „
Average	4,052 „	7,275 „	11,327 „

e) Markets and Trade Practices.

In former times, every producing centre, however insignificant, appears to have had its own market. But, as the outputs grew gradually larger, combined with the dual consideration of communication and financing facilities, etc., the markets for tussah silk have been limited to Antung and Kaiping as above stated.



COCOON BOILING KETTLE.

1. Antung.

The first transactions in wild cocoons at Antung were opened by a Chinese mercantile firm of the style of Hsinfengchan with the support of some American merchant of Shanghai. With the steady development of the industry and the sharp increase of demand for tussah silk in Japan after the great War, Antung,

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which is splendidly located for tussah silk trade, has had a flourishing business with Japan. A good many Japanese tradesmen have opened their offices at Antung, and now it may be said to have quite outstripped its seniors such as Kaiping, Chefoo, Shanghai, etc.

(1) Scope of business operation :

The scope of business operation with regard to wild cocoons extends from Huaijen, Kuantien, Hsifeng, and Hailungcheng on the north to the district along the Mukden-Antung Railway on the west, and Siuyen, Takushan, and Chuangho on the south.

(2) Dealers :

Some filatures are engaged also in dealing with their outputs. In other cases, Chinese dealers in general commodities ply the tussah silk trade additionally. Then there are many Chinese who make the business their sole vocation, in addition to a large number of Japanese merchants.

Japanese Dealers.

Mitsui Bussan Kaisha, Hsingtung Kungsu, Chentienhao, Takemoto Shokai, Suzuki Shoten (Messrs. Suzukis), Okamura Yoko, Suzuka Shoten, and Tasheng Filature.

Chinese Dealers.

Tungshengte, Hengtaichang, Chingyuanhao, Ishengchang, Tungtaiheng, Tungtaichan, Changchichan, Hungshunyung, Shuangshunho, Chunghoshun, Tungyisheng, Telichan, Junshengho, Tungshunchan, Yishengfu, Hochucheng, Hengshunching, Tungshengfu, and Liyuanchan.

Among the Chinese dealers, not a few put up their customers and clients at their establishments.

(3) How business is carried on and trade practices :

There are two kinds of deals, Spot and Future. In the case of a future deal, the brokers concerned undertake to answer for the quality of the goods, delivery date, etc. Concerning a spot deal, buyers are sought by the showing of samples in small quantities, and, when a bargain is likely to be closed, all the stocks are offered for inspection, and then the transaction is settled either way.

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(4) The details of deals are as under:—

(1) Unit of deal;

With regard to such goods as are known under distinct brands, 500 *kin* each of 1st and 2nd class goods, totalling 1,000 *kin*.

With regard to other kinds having no distinct brands, 100 *kin* each of 1st and 2nd class goods, or 100 *kin* of either kind.

(2) Standard currency;

In Antung taels per 100 *kin*.

(3) Method of payment;

In both Spot and Future deals, cash payment is to be made as the bargain is closed.

(4) Commission for brokers; 2%.

(5) Packing cost: To be borne by buyer.

(6) Allowance in weight for packings; 1 *kin* per 100 *kin* (one box).

In the case of large bank goods:

(1) Unit of deal; 1 bale (about 100 *kin*).

(2) Standard currency; In Antung tael per 10 *momme* (1/12 lb.)

(3) Method of payment; Cash payment in the case of both Spot and Future deals.

(4) Commission for brokers; 2%.

(5) Packing cost; To be borne by the buyer.

(6) Allowance in weight for packing; No allowance made.

2. Kaiping.

Kaiping (or Kaichow) used to be a thriving distribution centre of all supplies for Central Manchuria in bygone days. A junk port of the name of Tachinghokou (大清河口) was situated 2½ miles west of Kaiping. Formerly, this junk port maintained close junk traffic with Shantung ports which were then the only customers of tussah silk. On this account, there was a time when the major portion of tussah silk of Manchuria got accumulated at Kaiping for the purpose of export. After the Tungchi Era (under the Manchu Dynasty dating some 47 years back), the junk port became too silted for even junks to have access thereto. In point of general business, Kaiping was destined to be rapidly outstripped by

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Yingkou (Newchwang) and was quickly outshone, but in regard to tussah silk business, the old trade relations, the facilities provided by the local Chinese authorities, etc., Kaiping has been enabled to retain its title as tussah silk centre.

COCOON TRAYS. WILD COCOONS.

In the 25th year of Kwanghsu (1899), when the Boxers' Disturbance broke out, the communications between Kaiping and Yingkou or other coast ports were cut off, and, at that time, the stocks were forwarded to Antung, and there transactions with the south of Shantung and Shanghai were opened, and to this day, the two places, Antung and Kaiping, have continued the two largest centres for tussah silk.

With the steady ascendency of Antung as tussah silk market, the sphere of business operations of Kaiping has become encroached upon by Antung, still the tussah silk industry at Kaiping has been growing and promises to continue to grow.

(1) Sphere of business operations:

The sphere of business operations includes the southwest of Siuyen, the district about Haicheng and Liaoyang, the larger part of Fuchou and Chuangho, and part of Hsifeng and Hailungcheng.

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(2) Dealers:

The Kaiping dealers are divided into the buying dealers and selling dealers. Producers of wild cocoons and tussah silk often come to their buying dealers to stop, pending the close of transactions. Similarly, customers from all quarters going to Kaiping always find comfortable quarters with the selling dealers. Why the dealers are divided into these two kinds is said to be because they are desirous of looking after the interests of their own clients as far as it is consistent with their sense of business.

Almost every tradesman at Kaiping is concerned in tussah silk business directly or indirectly, but the most prominent dealers are as follow:—

Buying Dealers.

Liyuanchang, Talohsiang, Tatcheng, Yungtechang, Tientsengta, Tehohsiang, Tunghsingchang, Yuchuhsing, Shunchangte, Tehsinghung, Teyuhsiang, Yichenghsiang, Teshenghsiang, Fuchu-sheng, Tungshengchang, Kungyihsing, Chulungyu, Teshunho, Yunghohsing, Yunghochan, Tunghsinghou, Yishunhsiang, Tienhochan, Fuyichang, Kungshuncheng, Techengchan, Tehsinghai, and Chengtaisheng.

Selling Dealers.

Yihochang, Yuchangta, Teshenghsiang, Hengchangte, Taichangte, Hunghsingchan, Fuchengyi, Chuyuanhsing, Yichangsheng, Fushuncheng, Hofachan, Lunghsingte, Hunghsinglung, Changshenghsiang, Hungchanglung, Henghsiangte, and Henghsiangtung.

(3) Method of dealing and trade customs:

Both Spot and Future deals are conducted. The tussah silk reeled by any filature at Kaiping will be reported to a buying dealer from time to time to await customers. Any stock imported from outside Kaiping, on arrival at the town, will have a sample thereof taken about the selling dealers by an employee of the buying dealer. When any likely client is found, more sample will be presented, and business will be transacted.

In the case of future deals, a sample of the goods bargained for will be in possession of both seller and buyer, and delivery of the goods will be effected only when the goods are as good as the sample. Otherwise, the bargain may be cancelled or new goods will be manufactured as the buyer may wish.

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The common trade practices are as follow:—

(1) Unit of deal;

With such goods as are known under distinct brands, 100 *kin* each of 1st and 2nd class goods, totalling 200 *kin*.

With other kinds having no distinct brands, 100 *kin*.

(2) Standard currency;

In Kaiping tael per 100 *kin*.

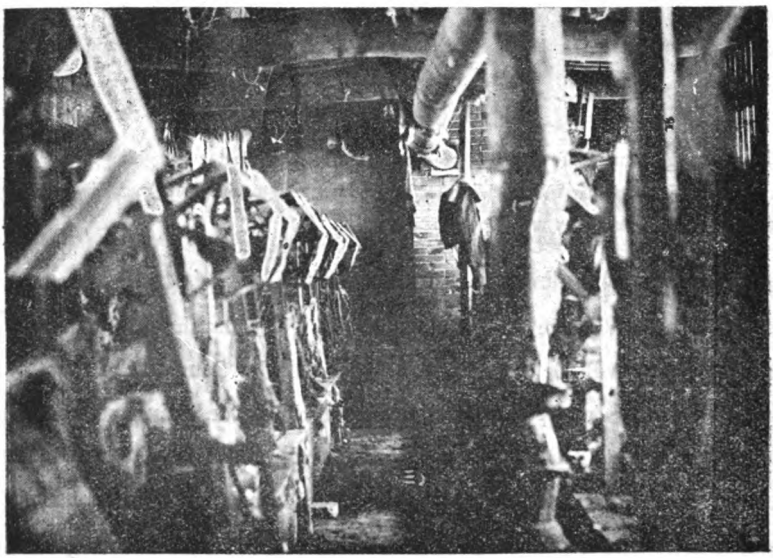
(3) Method of payment;

In both Spot and Future deals, cash payment is to be made as the bargain is closed.

(4) Commission for brokers; 2%.

(5) Packing cost; To be borne by the buyer.

(6) Allowance in weight for packings; 1 *kin* per 100 *kin* (a box) with goods under distinct brands, and 1½ *kin* per 100 *kin* with those without brands.



INTERIOR OF WILD FILATURE.

In the case of large hank goods:

(1) Unit of deal; 1 bale (about 100 *kin*).

(2) Standard currency; In Kaiping tael per 10 *momme* (1/12 lb.)

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(3) Method of payment; Cash payment.

(4) Commission for brokers; 2%.

(5) Packing cost; To be borne by the buyer.

(6) Allowance in weight for packing; No allowance made.

f) Costs Concerning Export.

The costs concerning export of tussah silk vary as the price and the Silver exchange rate fluctuate.

Supposing 100 *kin* of tussah silk to cost ¥600 and 100 Haikwan taels to be equivalent to G.¥150, the sundry charges incidental to export to Japan from the two greatest centres are as under:—

1. From Antung.

	To					
	Osaka	Gifu	Yokohama	Fukui	Mitsuke (Yechigo Province)	Remarks
Commission for brokers ...	Y 12	Y12	Y12	Y12	Y12	2% of market price
Packing cost:						
By passenger train	2.45	2.45	2.45	2.45	2.45	Packed in a box of 35 *kin* net or in 2 gunny bags of 45 *kin* each
„ goods train	3.67	3.67	3.67	3.67	3.67	100 *kin* net in a wooden box.
Export duty	2.50	2.50	2.50	2.50	3.50	Tael 2 mace 5 per 100 *kin* minus 1/3 reduction for frontier trade
Cartage	0.20	0.20	0.20	0.20	0.20	From dealers' to Antung Station
Railway freight:						
By passenger train	8.85	10.45	12.05	10.45	12.05	
„ goods train...	3.50	3.81	4.56	3.93	4.56	
Insurance	1.62	1.62	1.62	1.62	1.62	@ 2% per Y100
Terminal charges:						
By passenger train	—	—	—	—	—	
„ goods train...	0.20	0.20	0.20	0.20	0.20	
Total:						
By passenger train	27.60	29.22	30.82	29.22	30.80	
„ goods train...	33.67	24.00	24.55	24.11	24.75	

Remarks: With regard to large hank goods, when carried by a goods train, about ¥1.80 less per 100 *kin* in packing cost. Otherwise, the charges are the same as above.

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2. From Kaiping.

	Osaka	Gifu	Yokohama	Fukui	Mitsuke (Yechigo Province)	Kobe via Dairen	Remarks
Commission for brokers.	¥12.00	¥12.00	¥12.00	¥12.00	¥12.00	¥12.00	2% of market price
Packing cost:							
By passenger train ...	2.45	2.45	2.45	2.45	2.45	2.45	Packed in a box of 35 *kin* net or in a gunny bags of 45 kin each
„ good train	3.67	3.67	3.67	3.67	3.67	3.67	100 *kin* net wooden box
Export duty...	2.50	2.50	2.50	2.50	2.50	3.75	Reduction by 1/3 when via Antung.
Cartage...	0.30	0.30	0.30	0.30	0.30	0.30	From walled town to Railway Station
Railway freight:							
By passenger train ...	10.45	12.05	12.05	12.05	13.65	3.05	
„ goods train	5.13	5.44	6.19	5.56	6.19	0.82	
Insurance	1.62	1.62	1.62	1.62	1.62	2.70	27 sen via Antung 45 sen „ Dairen
Terminal charges:							
By passenger train ...	—	—	—	—	—	—	
„ goods train	0.20	0.20	0.20	0.20	0.20	0.20	
Steamer freight	—	—	—	—	—	6.00	@ ¥1 per ¥100 in original price
Shifting charges	—	—	—	—	—	0.30	
Total:							
By passenger train ...	29.32	30.92	30.92	30.92	32.52	30.45	
„ goods train	25.42	25.73	26.48	25.85	26.48	29.62	

Remarks: With regard to large hank goods, when carried by a goods train, about ¥1.80 less per 100 *kin* in packing cost. Otherwise, the charges are the same as above.

g) Markets and Uses of Tussah Silk.

1. Markets:

Until after the close of the Great World War, stocks of tussah silk used to be sent to Shanghai whence to be exported to the United States, France, Japan, etc. At present, the major portion is shipped direct to Japan from Manchuria, and a small portion finds its way to Shanghai for shipment abroad.

For reference sake, the countries of destination of tussah silk put out in China are given under:—

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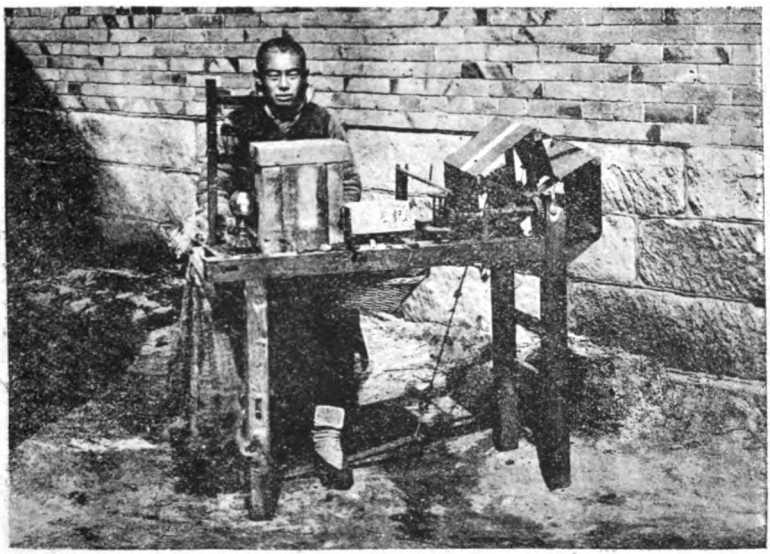
To	1915 piculs	1916 piculs	1917 piculs	1918 piculs	1919 piculs
Japan	8,179	7,657	6,193	13,291	20,376
United States	14,588	8,657	9,380	8,860	9,072
France	7,063	230	823	3,718	2,431
British India	59	12	—	—	—
Great Britain	299	279	57	85	50
Italy	681	10	176	1,019	93
Russia	280	165	34	—	9
Hongkong	284	1,515	43	63	69
Makao	2,497	241	1,318	1,540	1,486
Elsewhere	—	—	—	2	63
Total	33.930	18,682	18,024	18,588	33,644

2. Uses:

In Japan, tussah silk is used in a larger measure about Gifu and Fukui as material for the weaving of pongee silk fabrics for export. In these two Prefectures and also in Kyoto and Niigata (Yechigo Province) Prefectures, and elsewhere, tussah silk is used in the manufacture of mixed cotton and pongee fabrics and also as mererials for handicraft work.



INITIAL WASTE SILK AND NON-INITIAL WASTE SILK.

In Europe and the United States, tussah silk is used for making summer dresses for both sexes, window curtains, table cloths, laces, shirts, etc.

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h) Market Prices.

Tussah silk does not feel the effect of the general economic tone so keenly as ordinary silk. However, its uses being kindred to ordinary silk, its market quotations seem to follow closely those of ordinary silk.

For reference, the market quotations during the past five years are given in in table below :—

	Antung		Kaiping		
1915	by small hank	by large hank	by small hank	by large hank	Remarks
January	170	104	141	113	
February	180	112	138	115	
March	170	104	102	120	
April	175	104	142	121	Great War has
May	155	101	129	108	slackened the demand
June	150	112	135	108	
July	170	144	139	130	
August	190	176	155	165	
September	210	144	192	165	
October	300	192	265	200	
November	345	208	310	245	Demand reviving
December	270	192	250	210	America way
1916					
January	300	208	250	200	
February	350	220	290	245	
March	370	240	330	245	
April	320	192	295	245	
May	330	192	300	245	Demand arising in
June	330	260	285	235	Japan and America
July	360	250	325	301	
August	360	256	325	300	
September	360	232	325	300	
October	380	288	325	285	
November	400	310	370	320	American demand
December	400	300	365	300	brisk.
1917					
January	500	208	288	255	
February	350	220	300	218	
March	370	240	341	300	
April	360	240	305	285	Fair demand from Japan
May	320	200	290	245	
June	330	260	300	280	
July	360	250	300	260	

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August	360	256	325	265	Fair demand from Japan
September	350	232	330	200	
October	380	280	330	295	
November	330	210	285	240	
December	400	300	365	300	American & Japanese demand brisk.
1918					
January	330	276	300	270	Reactionary relapse
February	320	250	255	238	Demand from Japan
March	320	216	260	244	
April	330	271	260	245	
May	380	266	300	285	
June	400	176	360	345	Market rising from short stock
July	400	176	375	326	
August	370	176	300	288	
September	360	200	300	265	
October	350	176	300	265	
November	370	203	345	298	Weak from abundant stocks
December	355	200	310	290	
1919					
January	350	200	315	290	
February	415	243	388	290	Japanese demand brisk
March	305	229	300	290	
April	423	244	400	365	
May	370	209	295	269	
June	400	214	380	265	
July	430	267	390	356	
August	500	285	440	390	Reanimation of export of tussah silk fabrics to Japan.
September	485	295	440	400	
October	500	300	460	420	
November	560	360	510	420	
December	550	345	505	460	

Remarks: The quotations for small hank goods in the above table are the nominal quotations for stocks under distinct brands, whilst those for large hank goods represent the highest quoted on the market.

V. Bye-Products and Pierced Cocoons.

a) Waste Silk.

Waste wild silk consists of two kinds—one is what is obtained at the time of finding the yarn-ends, and the other is what is obtained during the reeling process.

The waste wild silk obtainable from 160 *kin* of tussah silk reeled varies in quantity according to the grade of the wild cocoons, the manner of boiling the

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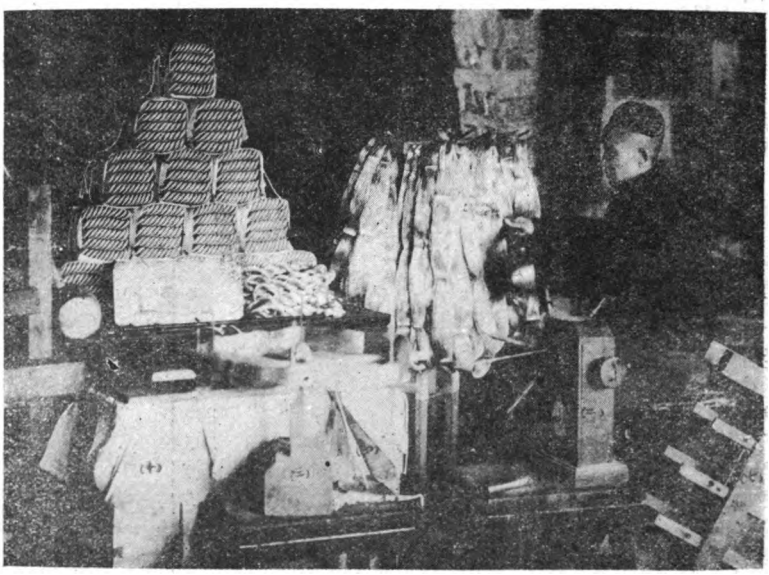
wild cocoons and reeling them, and the uses for which the silk is intended. But, ordinary wild cocoons will yield 36 *kin* of kind 1 and 41 *kin* of kind 2, totalling 77 *kin* in the case of small hank goods, reeled from 8 grains of cocoons at a time; with large hank goods, reeled from 15 grains of cocoons at a time, 28 *kin* of kind 1 and 22 *kin* of kind 2, totalling 50 *kin*, will be obtained.



INTERIOR OF FINISHING ROOM.

1. Places and Amounts of production.

All places where wild filatures are operated produce waste silk, too. The following is a list of production from 1915 to 1919:

	About Kaiping piculs	About Antung piculs	Elsewhere piculs	Total piculs
1915	11,356	7,309	4,319	22,986
1916	8,033	4,438	1,270	13,781
1917	11,228	1,890	1,011	14,129
1918	9,600	3,954	2,132	15,686
1919	7,920	11,729	4,244	23,086
Average	9,627	5,864	2,595	18,086

2. Method of dealing and trade customs.

All dealers in tussah silk everywhere handle also waste wild silk. In most cases, it is Spot Deals. Nothing but the outputs of the filatures producing goods

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under distinct brands is dealt in by future or forward contract.

The details may be enumerated under :—

Unit of deal :

In a lot of 200 *kin* consisting of 100 *kin* each of kind 1 and kind 2.

Standard currency :

About Antung, with small hank goods, per 200 *kin* of kinds 1 and 2 quoted in Antung tael ; with large hank goods, per *kin* of kind 1, also quoted in Antung tael, kind 2 being calculated as half worth as kind 1.

About Kaiping, with both small and large hank goods, per *kin* of kind 1 quoted in Kaiping tael, kind 2 being calculated as half worth as kind 1.

PACKING BEFORE SHIPMENT.

Method of payment :

In both Spot and Future deals, cash payment is to be effected as the bargain is closed.

Commission for brokers : 2%.

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Packing:

Packing is made in three kinds of bales weighing 100 *kin*, 150 *kin*, and 200 *kin*, costing about ¥1, ¥1.50, and ¥1.80 respectively, to be borne by the buyer.

TUSSAH SILK MARKET, KAIPING.

Markets and Uses:

Waste wild silk used to be exported to Shanghai almost wholly for shipment to Europe and America, until, since a few years ago, with the establishment of wild silk spinning plants in Japan and at Antung, some 60% of wild waste silk put out in Manchuria is used by these plants as raw materials.

b. Pupae.

The pupae produced from reeling 100 *kin* of tussah silk amount to about 300 *kin* dried. The aggregate outputs of Manchuria reach about 72,000 piculs. The outputs yielded in the district near the railway about Antung, Kaiping, Haicheng, etc., are exported in a small quantity to Chosen and Japan as fertilizer, but the larger portion is consumed as food or as manure for the vegetables about the places of production.

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c. Pierced Cocoons.

By pierced cocoons are meant the cocoons, out of which the pupae have come out, developed into moths to lay silkworm eggs. There are two kinds of such cocoons—Spring and Autumn cocoons.

1. Places of production and outputs.

Wherever wild cocoons are produced, pierced cocoons are put out. The annual total outputs are put at about 9,000 piculs on an average.

2. Method of dealing and trade customs.

Pierced cocoons are dealt in principally by Spot bargain through the medium of middlemen or brokers.

The trade customs may be itematized as follow:—

Unit of deal; In bales of 100 *kin* each.

Standard currency; In Antung or Kaiping tael per *kin*.

Commission; 2%.

Method of payment; In both Spot and Future deals, cash payment is made at the conclusion of a bargain.

Delivery of stock;

The goods are wholly taken delivery of by the weight. To weigh them, they are first put in some receptacle and stirred about a few times. Out of them, 1,000 grains are picked out at random, and then stained and other inferior cocoons are taken out. When such inferior cocoons are not more than five grains, the goods are accepted to be of fair quality, and weighed. In case of the number exceeding five, the percentage of the inferior cocoons may be lessoned by way of further elimination, or a reduction in price may be agreed upon.

Packing:

Pierced cocoons are packed with hemp cloth or osier matting in bales of 100 *kin* each, costing about ¥1.50 per bale, which is to be borne by the buyer.

d. Prices of Waste Silk & Pierced Cocoons.

The prices of waste silk and pierced cocoons fluctuate generally according to those of tussah silk.

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The market quotations at Kaiping from 1915 to 1919 are as under:—

		1915	1916	1917	1918	1919
January	Waste silk	104	111	136	157	154
	Pierced cocoons	—	82	106	—	—
February	Waste silk	104	120	139	154	150
	Pierced cocoons	—	—	119	—	—
March	Waste silk	95	121	149	163	169
	Pierced cocoons	—	—	—	—	—
April	Waste silk	103	121	163	162	177
	Pierced cocoons	73	—	—	—	—
May	Waste silk	107	120	154	167	150
	Pierced cocoons	—	—	—	127	145
June	Waste silk	110	121	154	171	188
	Pierced cocoons	80	91	124	123	155
July	Waste silk	119	134	155	194	165
	Pierced cocoons	100	104	123	113	140
August	Waste silk	117	135	161	203	182
	Pierced cocoons	99	105	131	113	135
September	Waste silk	119	133	159	171	195
	Pierced cocoons	99	112	129	120	160
October	Waste silk	131	137	146	178	220
	Pierced cocoons	101	102	116	136	210
November	Waste silk	124	137	156	169	220
	Pierced cocoons	94	—	—	141	225
December	Waste silk	131	129	157	153	230
	Pierced cocoons	101	—	127	128	260

The blanks in the above table denote that, owing to its being off the season, no transactions took place in the months indicated.

VI. Wild Sericulture at Chefoo.

The wild sericulture at Chefoo, which may be regarded as the rival centre to the same industry in South Manchuria, had its origin in a new filature founded on a joint capital put up between the great Li-hungchang (then Taotai at Chefoo) and a German businessman in the early years of Kwanghsu. This filature was styled the Huafeng Filature. It may be added that it was this Taotai who achieved a world wide fame as the foremost statesman of modern China and died in November, 1901. This enterprise reared in such cradle grew up year after year, making Chefoo practically the unchallenged tussah silk centre. However, as wild filature by means of small hank started to be popularly taken up in South Manchuria, which

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supplies wild cocoons to be wrought upon, the peerless position of Chefoo began to be shaken, and this enterprise has become developed in South Manchuria, as it were, at the expense of that at Chefoo.

It is true that lately the Chefoo filatures, in cooperation with the authorities, are endeavouring to turn the tide in their favour by introducing sundry measures for the protection and encouragement of the industry. But, the stern fact remains that more cost of production is required at Chefoo than in South Manchuria, and the Chefoo people can yet hardly be overoptimistic.

1. For reference sake, the prominent Chefoo filatures with particulars are given under :—

	Brands of outputs		No. of reeling machines
Yifengte	杏花	Apricot Blossoms	1,400
Yifenghsing	紡絲	Spinning Spindle	
	雙龍	Double Dragon	
	黑狗	Black Dog	
Hsitechi	鵲梅	Magpie & Plum	1,420
Tungtechi	鴛鴦	Mandarin Duck	
Tungyuanchi ...	鵪鶉	Quail	
Yutetai			
Yungchi	大陽塔	Sun Tower	670
	桂花		
	銅球	Copper Ball	
Chengshenglee ...	葵花	Hollyhock	560
	猩々	Orang-outang	
Hochi	水仙	Narcissus	360
Kungshenho	金蝙蝠	Golden Bat	540
	金鷺	Golden Heron	
Hsiangmaokung ...	耕牛	Ploughing Cattle	560
	人樂	Merry-making	
	黑猴	Black Monkey	
Yifutung	牡丹花	Peony Flower	620
	金魚	Golden Fish	
Hochuhsing	華聖頓	Washington	550
Tungtaishun	彩美人	Painted Beauty	400
	金寶星	Golden Treasure Star	
Yichang	雙象	Double Elephant	650
Lichi	黑塔	Black Tower	430
	黑馬	Black Horses	
Hotai		F T	360
	人傘	Umbrella	
Teshenghsiang ...	童子	Lad	280
Chengholsiang ...	漁人得利	Fisherman	330
Yuanmao	仙鶴	Crane	270
	紫金山	Tzuchinshan	
Taianheng	雙金駝	Double Golden Camel	310
	單金駝	Single Golden Camel	
	日本旗	Rising Sun Flag	
Yifeng	五彩旗	Five-Coloured Flag	400

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In addition, there are 19 filatures that put out goods without distinctive brands, having altogether 4,380 reeling machines.

TUSSAH SILK CARTED TO RAILWAY.

However, the majority of them lie inactive, and only some one-fifth of the total are being run.

2. Imported Wild Cocoons and Exported Tussah Silk.

	Imported Wild Cocoons piculs	Exported Tussah Silk piculs
1915	252,692	18,159
1916	77,523	10,309
1917	118,286	9,095
1918	172,286	12,494
1919	143,486	11,583

VII. Why Japanese Failed.

When the promising nature of wild filature was published according to the reports submitted by the Industrial Investigation Commission of the Agriculture & Commerce Office, Tokyo, immediately after the Russo-Japanese War, quite a number

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of Japanese embarked upon this line of industry, but none of them could score success. The causes of their failure may be traced chiefly to the following :—

1. Want of knowledge concerning wild silkworms.
2. Underrating of the difficulty attendant on wild filature, improvement of quality, etc.
3. Concentration of attention upon the improvement of details and neglect of the main principles of management.
4. Inadequate knowledge of the intricate "exchange" relations.

In a word, because of the Japanese being the first sericulturists in the world, they drew a hasty conclusion that the Chinese ways of carrying on the wild filature must have been virtually primitive and that they could easily apply their skill and experience in ordinary filature business to wild filature.

PACKING OF WASTE SILK.

It is a matter for congratulation that the Japanese have learned to treat wild filature business with a greater amount of practical common sense, and many now seem desirous of going about the business on lines of gradual and scientific improvement.

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Conclusion.

The wild sericulture, inclusive of wild filature, in South Manchuria, etc., is roughly as stated above.

Demand for tussah silk in the world is rapidly rising as improvements are being invented in dyeing, weaving, and patterning, and as new uses therefor are being found. There is certainly a tremendous possibility for the development of wild sericulture and filature in South Manchuria.

In order to develop this industry, I should like to suggest the following:—

1) How to rear wild silkworms, especially how to obtain wild silkworm eggs of an excellent kind, how to prevent the outbreak of diseases, etc., should be studied as specialities, and the results of investigations should be published to the end of increasing the cocoon harvests.

2) Some effective improvement of the quality of tussah silk should be conceived, applied, and popularized, such improvement being admissible to the existing Chinese filatures with their buildings, machines etc., and working hands.

Any inclination to get every invented process patented should be discouraged.

3) An Exchange for dealing in tussah silk should be established so as to facilitate the business therein.

4) A tussah silk examining station should be established, so as to unify the quality and maintain the reputation.

As regards (1) and (2), the Government will have much say, but as to (3) and (4), the Chinese filatures themselves are anxious to have the propositions materialized, and in case of the Japanese dealers and Chinese filatures being desirous of cooperating, the same propositions may be put in a tangible shape without difficulty as Sino-Japanese joint enterprises.

CURSE TO HUMANITY.

Prevention of Tuberculosis.

By Dr. K. Omi.

Tuberculosis is a curse to mankind. The victims claimed thereby annually are put at 2,000,000 people all over the world. In Japan alone, not less than

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100,000 lives are being wasted yearly. The havoc wrought by war is well known, and many will cry out its evils. It is regrettable that the terrible toll claimed by the most dreadful enemy, though unseen, to mankind, tuberculosis, is not yet thoroughly appreciated as widely as it ought to be.

Even during the Russo-Japanese War, those killed numbered 46,400 men, whilst the lives wasted by tuberculosis in 1905 totalled 96,030. It will thus be seen that the Japanese killed during the Russo-Japanese War lasting nearly two years numbered less than the victims of tuberculosis in only one year.

Although no accurate returns are yet available, during the Great World War, the aggregate killed are put at about 9,829,000. Even the colossal war, which lasted over five years and was the most sanguinary and gigantic warfare ever fought with the most deadly implements of slaughter, could not take any more lives than those lost to tuberculosis during the same length of time.

Moreover, tuberculosis recurs every year, whilst war is only sporadic, occurring at intervals. At least, as a life-waster, tuberculosis is far more destructive than war.

Tuberculosis is infectious, and if left alone, it will work an incalculable harm. But if adequate means be adopted, its prevention and even extermination will be accomplished without much difficulty. Therefore, every civilized country is earnestly working to the end of preventing and exterminating the disease. In several senior countries in the West, a remarkable result has already been reaped. The Japanese Government, too, has taken a broad stride forward and has established the Tuberculosis Prevention Act. Cities, each containing more than a population of over 50,000, and even public organizations, when deemed necessary, are ordered to found and maintain a tuberculosis sanatorium, the National Treasury allowing a grant thereto. The Prefectures, too, are, in many cases, establishing private organizations aiming at the prevention of the disease in an effort to respond to the cry of need of the times. In Manchuria, also, the time has ripened at length, and the Anti-Tuberculosis Society has been brought into being to contribute to the prevention and extermination of the malady in the cause of humanity. It is rather late, but all the same, is worthy of congratulation.

This handmaid of Death, tuberculosis, takes up more than one-tenth of the aggregate mortalities. If the cities with more than a population of 50,000 only are reckoned with, the mortality percentage rises above 18% (with particular

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reference to the fiscal year 1916). It is, as already indicated, contagious through the medium of the so called "tubercle bacilla" discovered by the great German bacteriologist, Dr. Robert Koch thirty-eight years ago. These bacilla can thrive parasitic in any parts of the body, causing tuberculosis. It may assume the form of pneumonic and intestinal tuberculosis, peritoneum, tuberculous meningitis, lymphatic tuberculosis (scrofula), or the tuberculous affection of the skin, bones, joints, or urinary or genital tuberculosis. Of the above, pneumonic tuberculosis or consumption is the most destructive, as may be seen from the following table showing the mortality percentages from different kinds of tuberculosis extending over ten years from 1905 to 1914:

Deaths from	
Consumption	79,340
Intestinal tuberculosis	15,157
Tubercular meningitis	5,876
Other forms of tuberculosis	5,966
	106,339

The above shows that consumption contributes just a little less than 75% of the total deaths from all kinds of tuberculosis, and of the aggregate causes of death all over Japan, its share amounts to 7.3%, and speaking of cities of over a 50,000 population, it causes death to the extent of a little less than 14%. Then, with reference to young people from 15 to 30 years of age, its percentage of all deaths is 30% throughout both urban and rural districts, and 40% in the urban districts. Among the rank and file of the Army and the Navy, which, needless to say, are composed of the pick of strong able-bodied men in their prime of life, about 20% of the total deaths is ascribed to tuberculosis.

Tuberculosis partakes of a chronic nature, and even in the case of consumption, which runs a comparatively short course, it generally takes from a few years often to more than ten years' time before death intervenes. Therefore, the number of the living victims must be counted by hundreds of thousands.

In the Senior Western countries, the strenuous life attendant on the advance of civilization is encroaching upon the birth rate to a marked degree. At the same time, the gradual decrease of the mortality rate is more remarkable, and on this account the rate of increase in population has been on the increase in some countries. In Japan, the birth rate has not yet begun to fall off. On the contrary,

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it is on the increase. Neither has the death rate shown any tendency to decrease, but it tends to increase more or less. In the Western countries, the decrease of the death rate is owing to its reduction in the juvenile and youthful stages of life by dint of science and skill. The prevention of tuberculosis constitutes the most telling factor in the decrease of deaths in the youthful stage. On the other hand, the rise of the mortality rate in Japan is mainly due to the rise of the mortality rate from tuberculosis in the youthful period of life. Taking young people from 15 to 30 years of age, who make up the very mainstay of the people, deaths from the same cause are about three times as many as in the West.

Since the close of the great World War, the world's general situation has been radically altered, and the promotion of the physical strength and endurance of the people has become one of the most urgent requisites. Does Japan, which suffers so awful a havoc to be wrought by tuberculosis among the cream of its people, hope for success in the world's race of science and other useful activity?

And, as already observed, tuberculosis remains the most highly destructive agency. That the campaigning against tuberculosis brooks no delay or neglect can need no further elucidation.

Let us now turn to the situation in Manchuria.

The mortality rates in Japan and South Manchuria are as under:—

		Percentage of deaths from tuberculosis	Deaths from tuberculosis per 10,000 people
Japan	All over the country	9.74%	21.20 deaths
	Cities only	18.47%	36.90 „
Kwantung Leased Territory & S. M. Railway Area... ...	Japanese	11.65%	23.84 „
	Chinese	8.01%	15.77 „
	Average	8.50%	16.79 „

Remarks: The figures for Japan are the averages for nine years from 1906 to 1914; those for South Manchuria are the averages for the ten years from 1909 to 1918.

Speaking of the Japanese, the death percentage from tuberculosis to the total deaths is 11.65% for South Manchuria, as against 9.74% for Japan. Next, as regards the death rate from tuberculosis per 10,000 people, the figures are 23.85 people for South Manchuria, as against 21.2 people for Japan. In both cases, the rates for South Manchuria are a little higher than those for Japan.

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However, the Japanese in South Manchuria mostly reside in cities and towns, on which tuberculosis is apt to maintain a more powerful hold, and, strictly speaking, cannot be compared with Japan, in which the rural inhabitants, who are comparatively freer from consumption, occupy the major portion of the entire population. More correctly, the Japanese in South Manchuria may be compared with the urban inhabitants in Japan. Now, in Japan, the mortality figures for the urban people concerning tuberculosis are 18.47% and 36.9 people per 10,000 people whilst, as mentioned above, the figures for South Manchuria are 11.65% and 23.85 people per 10,000 people, being very much lower.

Individually observed, such cities as Sasebo, Fukuoka, etc., in Japan have the death rates from tuberculosis still lower than in South Manchuria. It may be borne in mind that, when one falls victim to tuberculosis in South Manchuria and gets incapacitated from work, one is apt to go home to Japan for treatment or for a change of air to get the benefit of the more congenial climate of Japan. For instance, from the records of the South Manchuria Railway Company Mutual Relief Society, it will be seen that the deaths from the disorders of the respiratory organ, which are closely allied to tuberculosis, such as consumption, pulmonary infiltration, pneumonic catarrh, pleurisy, etc., are 1.7 per 1,000 people, whilst in glaring contrast with the above, those affected by the same diseases, who have left the Company's service because of that, are 6.96 per 1,000 people, the latter being more than four times as many as the former. The larger portion of those who have left the service may be considered as home-goers, and this point should be borne in mind.

The death rates for the Chinese in the Kwantung Leased Territory and along the South Manchuria Railway Area are found on paper far lower than those for the Japanese. However, this apparently low death rate might be taken with a grain of salt, considering the standard of living of the Chinese, their sense of hygiene, etc. Can it not be due to the omission of a large number of tubercular cases from the table of statistics mainly because of the random inaccurate diagnosis of the Chinese specialists, for whom the Chinese mainfest a decided preference before those of another nationality.

In a word, it is fortunate that, in Manchuria, the hold of tuberculosis on the inhabitants is yet neither widespread nor firm. However, the mixed residence with

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the Chinese in possession of only a meagre sense of hygiene along with the peculiar effects of the climate and other phenomena (like dust evil, smoke nuisance, etc., Ed. *L. of M.*) and the architectural features (which being more of foreign style, demand greater attention for ventilation than the genuine Japanese houses with their *shoji*, Ed. *L. of M.*), all conspire together for the spread of the awful disease. Effective measures for checking the spread and for stamping out the disease cannot be adopted and enforced too soon. Slackness or tardiness in the anti-tuberculosis campaign would bring in its train an indescribable misery and suffering, not to say the wasting of many a precious life. On such ground, we have raised a cry for the campaign, and in the prosecution of the worthy campaign, the Japanese should elect themselves a vanguard leading the masses of their neighbour-inhabitants to the end of carrying on the noble fight in the interest of humanity to a happy consummation.

The following is the table giving the tubercular figures for the chief cities in Japan having a population of more than 50,000 each and the Kwantung Leased Territory and the South Manchuria Railway Area in 1913:—

	Population	Deaths from tuberculosis	Death rate from tuberculosis per 10,000 people
Tokyo	2,050,126	8,151	39.76
Kyoto	509,380	1,930	37.88
Osaka	1,395,823	3,952	28.31
Sakai	67,706	220	32.49
Yokohama	397,574	1,248	31.39
Yokosuka	85,473	202	23.63
Kobe	442,167	1,327	34.52
Nagasaki	161,174	350	21.72
Sasebo	94,914	137	14.42
Niigata	66,622	189	18.37
Nagoya	452,043	1,013	22.41
Shizuoka	64,108	211	32.91
Sendai	104,141	340	32.65
Fukui	56,218	231	44.65
Kanazawa	129,804	511	39.37
Toyama	64,822	186	28.69
Okayama	86,961	268	30.82
Hiroshima	167,130	519	31.05
Hyogo	128,342	308	24.00
Shimonoseki	72,117	190	26.35
Wakayama	77,683	210	27.03

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			Population	Death from tuberculosis	Deaths rate from tuberculosis per 10,000 people
	Tokushima		70,292	214	30.44
	Fukuoka		97,303	170	17.47
	Moji...		71,977	172	23.76
	Kumamoto		68,167	243	33.63
	Kagoshima		75,907	207	27.27
	Sapporo		96,924	264	27.24
	Otaru		92,864	256	27.57
	Hakodate...		99,795	366	36.68
South Manchuria	Kwantung Leased Territory	Japanese	47,381	104	21.95
		Chinese	469,674	798	16.99
	S. M. Railway Area	Japanese	30,282	67	22.13
		Chinese	48,114	7	1.46
	Total	Japanese	77,663	171	22.02
		Chinese	517,788	805	15.55
		Total	595,451	976	16.39

Annual Mortality Table from Tuberculosis.

In Kwantung Leased Territory and S. M. Railway Area.

From 1911–1918.

		Population at end of year		Deaths from Tuberculosis		Death rate from Tuberculosis per 10,000	
		Japanese	Chinese	Japanese	Chinese	Japanese	Chinese
1911	Kwantung Leased Territory ...	41,260	446,760	95	745	23.02	16.88
	South Manchuria Railway Area ..	26,054	32,930	53	2	19.96	0.61
	Total... ...	67,314	479,690	148	747	21.99	15.57
1912	K. L. T.	45,356	456,283	131	727	28.88	15.93
	S. M. R. A. ...	28,212	40,413	59	8	20.91	1.98
	Total... ...	73,568	496,696	190	735	25.83	14.79
1913	K. L. T.	47,381	469,674	104	798	21.95	16.99
	S. M. R. A. ...	30,282	48,114	67	7	22.13	1.46
	Total... ...	77,663	517,788	171	805	22.02	15.55
1914	K. L. T.	49,027	473,280	171	754	34.88	15.93
	S. M. R. A. . .	33,158	51,401	55	6	16.59	1.17
	Total... ...	82,185	524,681	226	760	27.49	14.48
1915	K. L. T.	50,253	490,584	155	947	30,84	19.30
	S. M. R. A. ...	34,845	60,225	68	9	19.51	1.49
	Total... ...	85,098	550,809	223	956	26.20	17.36
1916	K. L. T.	52,658	502,349	148	1,018	28.11	20.26
	S. M. R. A. ...	38,387	64,052	61	5	15.89	07.8
	Total... ...	91,045	566,401	209	1,023	22.96	18.06
1917	K. L. T.	55,637	516,772	158	1,072	28.40	20.74
	S. M. R. A. ...	44,087	72,033	91	32	20.64	4.44
	Total... ...	99,724	588,805	249	1,104	24.96	18.75
1918	K. L. T.	60,242	523,147	160	1,286	26.56	24.58
	S. M. R. A. ...	52,530	86,510	68	41	12.94	4.74
	Total... ...	112,772	609,657	228	1,327	20.22	21.77

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		Those affected by			Percentage of	
		General diseases	Specified infectious diseases	Tuberculosis	S. Infectious d.	Tuberculosis
1911	Japanese	125,400	641	1,123	0.51	0.89
	Chinese	21,224	434	178	2.04	0.83
	Others	596	—	5	—	0.83
1912	Japanese	133,990	848	1,578	0.63	1.18
	Chinese	32,927	140	349	0.44	1.05
	Others	1,024	3	3	0.29	0.29
1913	Japanese	137,076	1,079	1,888	0.78	1.38
	Chinese	39,860	388	546	0.97	1.37
	Others	907	1	3	0.11	0.33
4914	Japanese	148,660	1,509	1,714	1.01	1.15
	Chinese	43,772	417	595	0.95	1.35
	Others	1,340	2	4	0.15	0.30
1915	Japanese	154,850	1,207	1,714	0.78	1.11
	Chinese	47,564	311	670	0.65	1.44
	Others	1,635	3	6	0.18	0.63
1916	Japanese	179,179	1,345	1,832	0.86	1.02
	Chinese	65,411	496	1,005	0.75	1.44
	Others	1,418	5	9	0.35	0.63
1917	Japanese	211,478	2,394	2,806	1.13	1.13
	Chinese	84,190	422	952	0.50	1.13
	Others	1,974	8	11	0.40	0.55
1918	Japanese	235,414	2,157	4,511	0.92	1.92
	Chinese	81,624	684	1,712	0.84	2.10
	Others	2,574	4	44	0.16	1.70

CURRENT NEWS.

KIRIN-KWAINEI RAILWAY.

Its Utility as Artery of Commerce.

The provisional agreement concerning the Kirin-Kwainei Railway being the extension of the existing Kirin-Changchun Railway) having expired recently, it awaits a renewal.

Mr. Ono (Vice-President, the Industrial Bank of Japan) has been at Peking in order to negotiate informally with China as to what should be done.

Some elucidation on the proposed line may be of some interest.

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What is now referred to as the Kirin-Kwainei Railway is the missing link between the Kirin-Changchun Railway and the Kwainei-Seishin Section of the Chosen Railways. The proposed route is 262 miles in length, and passes, starting from Kirin, such places as Tatun, Hsiakiang, Mifeng, Shuangchaho, Ohomuchan, Pataohotzu, Laoyehling, Takuchiatzu, Tachiaoho, Wulintun, Wulinkou, Chingling, Hsiaomachiatzu, Weihuling, Paotzukou, Pingfang, Chengchang, Choulitzukou, Peiweitzukou, Tunhua, Tungtuyaotzu, Tashihtouho, Panchiaotzu, Haerhpa, Lingfengmichetzu, Liangchutai, Yushuchuan, Laotoukou, Shankuantaokou, Fungfassu, Tungkuantaokou, Chaoyangchuan, Lungchingtsun, Holunghsien, Huakushengling, etc. Most of the country the proposed line is to traverse is mountainous. The Sungari, Mutan, and Tumen Rivers with their tributaries wind through this region, and their valleys contain fertile strips of land. Then, the zone marked with gentle undulations is mostly suited to cultivation and has plenty of room left for reclamation. The reclamation work will be extended as the means of communication is developed.

At present there are no rapid means of communication and this territory is practically cut off from the outside world. Therefore few immigrants are attracted to this region. Moreover, it is surrounded with mountain ranges like high walls. For instance, between Kirin and Omso and Tunhua, the two ranges of the Laoyehling and Changkwangtsailing run from northeast to southwest; between Chosen Peninsula (Korea) and Chientao there rises the Huaku Range; between Tunhua and Harbin there is the Paling Range; and on the south the Lungkang Range and the Mutanling Range, which are spurs of the Paitoushan Range.

This region is only sparsely populated, and it has no indigenous industry thriving. Consequently, there is only 1,200,000 hsiang (or 864,000,000 *tsubo*) of land under cultivation. This arable tract divided among the twelve Prefectures of Kirin, Huatien, Mengkiang, Shulan, Panshih, Tunhua, Omso, Ningan, Yenchi, Holung, Wangtsin, and Hunchun, gives only a most modest average.

But, in the event of the Kirin-Kwainei Railway now in project being opened to traffic, the arable area will be doubled in a short space of time. Especially, the agricultural products to be put out from the Sungari Valley and the fertile fields in Chientao, which are often called the "Granary of Manchuria" will be of

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enormous quantity. Therefore, the absorption of goods for conveyance by the new railway will prove an interesting theme to follow.

However, the major portion of the goods to be carried by the railway will consist more of such as are in transit from Changchun, as the station of dispatch, to the Korean outlet, Seishin, than cargoes for conveyance between two given points on the new line. For this reason, the products along the Harbin-Kwanchengtzu Section of the Chinese Eastern Railway and also the Kirin-Changchun Railway will be forwarded via the new railway for Japan, and as return freights, Cotton Yarn and Cloth, together with sundries, will be brought for distribution to the district along the Kirin-Kwainei Railway.

At all events, the development of the districts to be served by the new Kirin-Kwainei Railway promises to surpass the most sanguine expectations.

MANCHURIA ENLIGHTENING SOCIETY.

Whose Organ the "Light of Manchuria" is.

What actuates us in our endeavours to open up Manchuria and Mongolia lies in realizing our ultimate ideal in the enlightenment and development of Manchuria and Mongolia. It will not do only to develop the natural and industrial resources, but the ethical and intellectual culture of the inhabitants must also be carefully husbanded and nourished, so that both mind and matter may be developed in harmony.

The Manchuria Enlightening Society raised its first cry in order to fill a sorely felt need. Its primary mission is to investigate and propagate the truths of the development of Manchuria and Mongolia. We shall studiously refrain from misleading the public by disseminating inaccurate or exaggerated reports, but shall steadfastly adhere to the truth or facts only.

It is urgently important that the truths regarding Manchuria and Mongolia should be made known clearly not only to Japan and China, but also to Europe and America. On this account, the establishment of the Manchuria Enlightening Society is bound to have a serious significance of international character.

If happily, through the establishment and activity of this Society, the truths of the development of Manchuria and Mongolia should become topics of world wide interest, it would not be only an honour to those now actively engaged in developing these regions, but also a matter of congratulation to the world at large.

We might be permitted to add that the ultimate ideal and desire of this Society are to serve as the herald of all enlightening movements in future, thereby opening a new chapter in the annals of the world's civilization.

What is the Society Like.

a) Office.—The office of the Society is in the Municipal Office Building on Central Circle in the city of Dairen.

b) Society's Work.—The works of the Society include the following :—

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1. Publication of the organ of the Society, The "Light of Manchuria."

2. Supply of general information through the Socitey and by other means, giving the results of such investigations and researches as may be conducted in the interest of the development of natural, industrial, and other resources in Manchuria, Mongolia, and Eastern Siberia.

3. To act as guide to intending investors in general in all kinds of enterprises in Manchuria, etc., and also to undertake any special investigation or research on application by promoters of all kinds.

4. To offer facility to travellers on inspecting visits to Manchuria, Mongolia, Siberia, Chosen (Korea), China, etc., to the end of importing accurate information and rendering their observations as close to truth as possible.

5. To use all kinds of means in order to propagate the true conditions obtaining in Manchuria, etc., and further to carry on the propaganda work for these regions through the medium of lecture meetings, exhibitions, etc.

6. To compile, publish, sell, and distribute books, pamphlets, etc., bearing on Manchuria and Eastern Siberia.

7. To carry on other works necessary for disseminating information on Manchuria, etc., and also for fostering economic enterprises therein.

c) In carrying on the above work, the Society is divided into the following :—

Secretariate,
Research Department,
Publication Department,
Intelligence Department, and
Accounting Department.

d) Any one wishing to join the Society is requested to send in a written application, giving the name and address, accompanied with the membership fee for not less than three months paid in advance.

e) The membership fee, entitling the member to a copy of the monthly organ, costs 50 sen (½ yen) per month and ¥6 per annum.

Remittances.

All remittances to this Society may be made most conveniently and safely to Transfer Savings No. 2850, Dairen. No receipts for the same will be issued, but instead the Society's monthly organ will be sent.

Officials.

Baron S. Goto (Mayor of Tokyo), President.

Mr. S. Nakanishi (ex-Vice-President, South Manchuria Railway Company), Chairman;

Mr. Y. Aioi (Chairman, Chamber of Commerce, Dairen), Vice-Chairman;

Dr. George Matsumoto (Vice-President, South Manchuria Railway Company).
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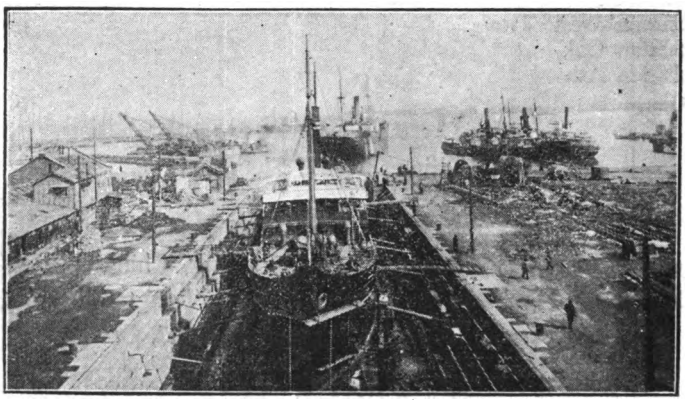

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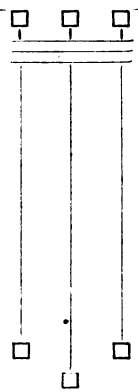

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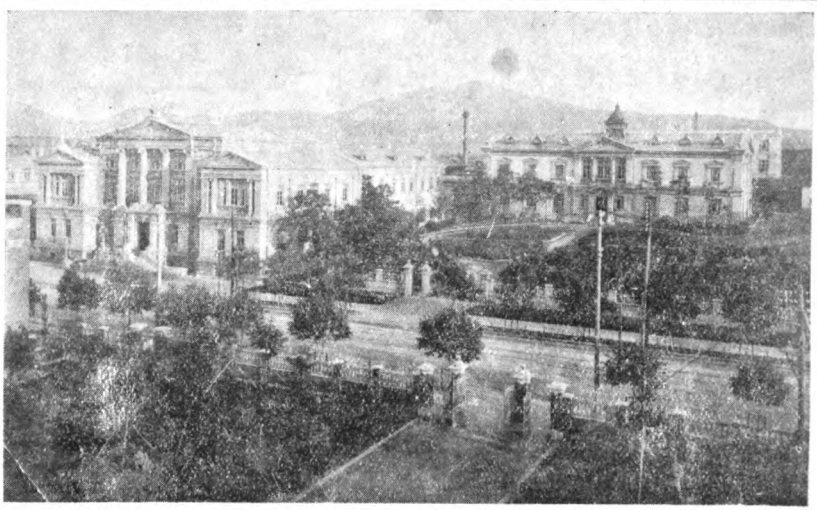

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THE
LIGHT OF MANCHURIA

PRESENT AND FUTURE OF DAIREN WATERWORKS.

By Dr. Y. Kuratsuka.

Dr. Y. Kuratsuka has been in charge of the Dairen Public Works Department of the Kwantung Government.—Ed. *L. of M.*

I. Introduction.

The most important feature of a waterworks is the installation at the water source. The water source varies according to the geological, geographical, and also meteorological conditions. But it may be classified into (1) drawing upon a river or a lake, (2) dependence upon a spring or natural fountain, (3) damming of rain water in a reservoir constructed for the purpose, and (4) drawing of a subterranean water at a great depth by means of wells, hundreds or sometimes thousands of feet deep. These may, however, be disposed under the two general heads of a surface water source and a subterranean water source.

Still, in whatever case, for the water at a water source, rain water must be depended upon. Rain is, indeed, given man to serve as the primary source of water supply, for one. For this reason, the amount of rainfall is a most important factor to be considered in designing a waterworks of a city. For the authorities entrusted with the design and construction of a waterworks, the most essential things to be done are to make a comparative, comprehensive study of rainfall, temperature, evaporation, velocity of wind, etc., together with the topographical and geological conditions of the particular locality, for which the waterworks is intended, and to draw a scientific and rational conclusion from the premises at command.

We will now take up Dairen.

The annual rainfall at Dairen amounts to only about 600 millimetres, being not more than two-fifths of the mean annual rainfall for Tokyo, which is 1,500 millimetres. The Dairen figure even ranks below that for Hokkaido, the driest district in Japan.

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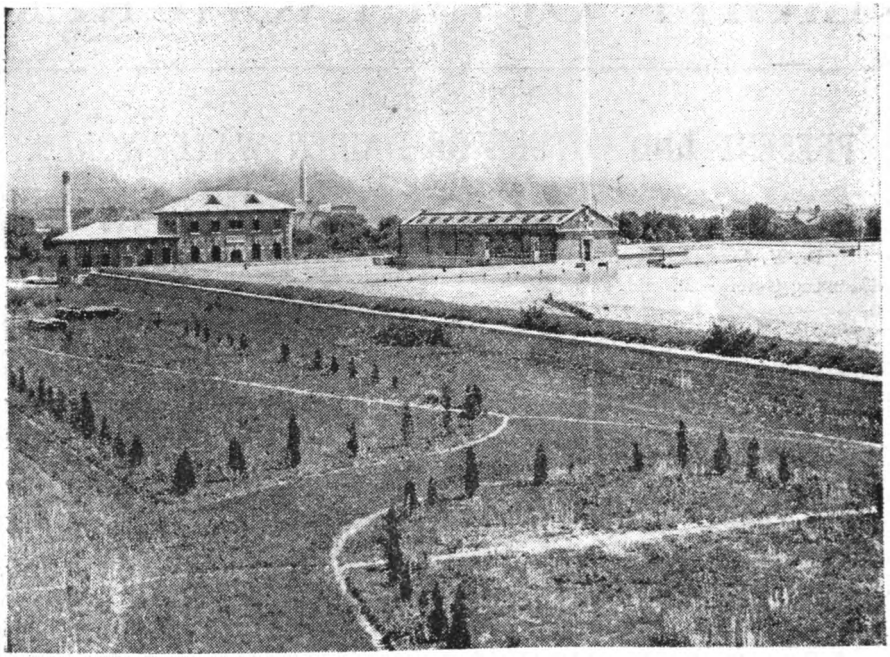

GENERAL VIEW OF THE WATER WATERWORKS

The following is a table giving the monthly rainfalls from 1905 to 1918 :—

Table 1 (in millimetres).

	January	February	March	April	May	June
1905	8 4	1.8	20.7	23.4	45.9	37.3
1906	13.0	39.4	4.7	16.0	38.0	50.0
1907	1.3	0.6	3.6	33.4	94.2	65.1
1908	14.0	2.6	0.1	4.8	87.6	20.8
1909	18.5	1.3	7.6	18.2	40.8	26.2
1910	8.8	0.1	12.6	3.6	32.8	49.0
1911	48.7	7.5	39.2	34.5	4.4	27.3
1912	0.8	25.9	4.5	37.6	99.0	35.4
1913	11.4	0.0	5.3	61.9	2.4	78.6
1914	10.8	6.2	88.4	1.2	17.3	77.9
1915	32.6	21.5	26.1	18.8	54.8	61.0
1916	26.9	12.1	10.5	30.0	49.2	73.6
1917	0.1	6.7	7.2	4.0	40.0	26.5
1918	0.0	0.4	55.7	8.7	109.5	84.4
Annual average ...	13.94	9.00	20.44	21.15	51.14	50.93
Percentage	2.19	1.41	3.20	3.32	8.01	7 98

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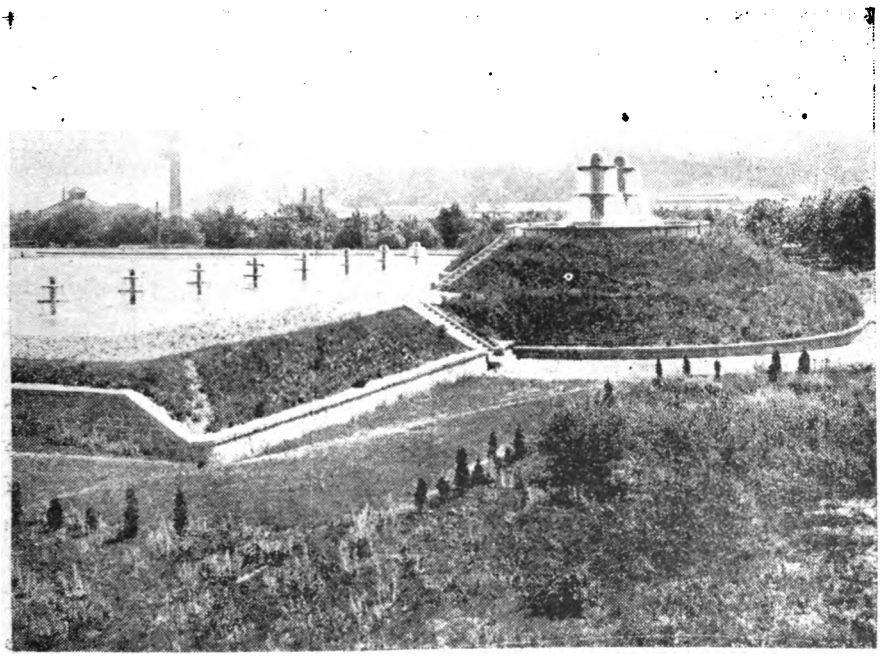

PURIFICATION PLANT OF THE DAIREN AT SHAHOKOU.

	July	August	September	October	November	December	Total
1905	164.4	89.4	97.7	24.6	12.2	23.5	549.3
1906	172.3	46.1	3.1	11.3	15.0	17.5	426.4
1907	201.8	130.5	62.1	13.7	24.6	4.2	735.1
1908	122.2	100.3	140.9	56.8	4.9	1.7	556.7
1909	240.8	227.0	100.1	29.9	9.3	7.6	727.2
1910	97.0	57.4	12.0	27.0	64.2	3.0	367.5
1911	405.9	100.8	28.61	28.0	69.2	21.1	1,072.7
1912	111.2	106.6	62.1	51.7	3.3	14.1	552.2
1913	97.5	79.2	32.2	43.8	8.8	0.5	421.6
1914	128.8	389.1	323.4	33.6	42.2	6.0	1,124.9
1915	265.9	20.5	11.1	31.6	12.3	0.5	556.7
1916	57.8	78.7	63.0	8.8	10 3	20.0	440.9
1917	298.1	138.5	150.4	23.7	37.1	11.6	743.9
1918	129.0	197.1	78.7	23.4	51.9	19.9	758.7
Annual average ...	178.06	125.80	101.64	29.14	26.09	10.80	638.13
Percentage	27.90	19.71	15.93	4.57	4.09	1.69	100.00

The above will show that the annual average rainfall is 638.13 millimetres. Looking over the monthly distribution of rainfall, one will find that the heaviest

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rainfalls are experienced during the three months of July, August, and September, followed by May and June. In any of the other months, the rainfall is usually very light. In other words, the rainy season runs from about the middle of June to the latter part of August, and the dry season from November to the ensuing March. In particular, February has the lightest snowfall and during this month the dry cold characteristic of Manchuria reigns.

Thus, the total annual rainfall amounting to only about 600 millimetres, the rivers and brooks have only a nominal amount of water running throughout the year, except in times of freshets which occur at irregular, but distant intervals. It may be added that the flood is only short-lived in most cases.

To cite a few instances in Western countries for comparison's sake, in the United States, the annual mean rainfall varies from 1,925 millimetres to 233 millimetres, and the local rainfall about Dairen may be likened to that for part of the central plain in the United States and also San Francisco on the Pacific coast.

Next, in Germany, the rainfall ranges from 2,120 millimetres to 410 millimetres. Compared with Posen, Preussen, and Sachsen Provinces which are the driest regions in Germany, the Dairen district has a rather heavier rainfall, and ranks about the same with such provinces in North Germany as Schleswig, Holstein, Hanover, and Westphalia.

In Great Britain, along the western coasts, the annual rate is far higher, it being from 1,500 millimetres to 2,000 millimetres. But, London is much alike, its rainfall being some 640 millimetres.

The rainwater, once it has fallen on the surface of earth, is partially absorbed into the rivers and is emptied into the sea. In part it percolates the ground, and this in its turn appears partially on the surface in due course of time to join the rivers. It thus makes up the ordinary flow or constant flow of the rivers. The other portion goes down in part deeper into the ground, and forms the subterranean water. The remainder evaporates and disappears. Therefore, what flows into the rivers and what percolates the ground are both available for feeding the water source. However, what goes up in vapour is not to be recovered or counted upon.

Accordingly, in the study of the possibilities of a water source, the evaporation amount must be looked into as much as the rainfall. The evaporation amount is

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controlled by sundry causes such as the season, direction and velocity of wind, topographical conditions, density of botanical growth, geological peculiarities, etc. The study of these phases is enough to constitute a speciality each in themselves. But, most commonly, the evaporation amounts of the water, as gauged with evaporometers at the meteorological observatories at the different points, are taken into reckoning.

The following is a table of the monthly evaporations from 1905 to 1918:

Table 2 (in millimetres).

	January	February	March	April	May	June
1905	35.3	58.5	96.5	141.5	220.9	170.9
1906	44.4	24.8	92.6	214.2	244.3	232.8
1907	70.7	73.9	127.5	181.0	187.8	197.3
1908	32.6	41.8	102.3	172.3	215.2	207.6
1909	40.9	58.3	90.0	148.9	200.8	197.7
1910	73.8	76.3	91.8	143.9	236 3	195.4
1911	41.5	45.3	72.1	123.3	243.0	251.5
1912	46.3	50.7	89.2	195.3	196.9	192.1
1913	41.1	46.8	101.0	146.2	248.9	165.7
1914	38.0	40.8	73.4	144.5	257.4	215.5
1915	32.4	35.7	78.5	139.4	194.1	195.2
1916	30.8	38.4	76.3	144.0	233.1	201.4
1917	41.3	46.1	101.1	176.6	205.8	212.0
1918	60.2	62.2	82.3	133.0	135.2	147.5

	July	August	September	October	November	December	Total
1905	232.9	193.8	145.7	151.3	151.0	81.7	1,679 0
1906	196.0	202.9	238.4	167.0	97.6	76.7	1,831.7
1907	138.8	131.1	121.7	108.0	66.2	51.4	1,455.4
1908	173.5	170.4	138.2	101.6	72.9	56.2	1,484.6
1909	149.2	126.0	130.0	180.3	144.1	90.6	1,556.8
1910	150.1	160.8	180.5	127 0	71.7	46.8	1,554.4
1911	164.9	141.8	110.4	110.8	69.1	43.8	1,416.3
1912	204.6	142.9	140.1	105.0	65.6	36.9	1,465.6
1913	168.9	165.6	152.5	105.5	72.7	46.9	1,401.8
1914	160.1	131.2	106.9	99.1	69.4	49.6	1,385.9
1915	169.8	156.7	157.5	98.1	75.4	58.5	1,391.3
1916	212.8	178.3	163.4	114.3	51.9	36.5	1,481.2
1917	175.0	156.5	112.2	107.3	52.7	60.1	1,446.7
1918	123.9	122.2	101.4	93.3	50.7	47.9	1,159.8

From the above table, it will be seen that the minimum annual evaporation was 1,385.9 millimetres for 1914, and the maximum 1,831.7 millimetres for 1906.

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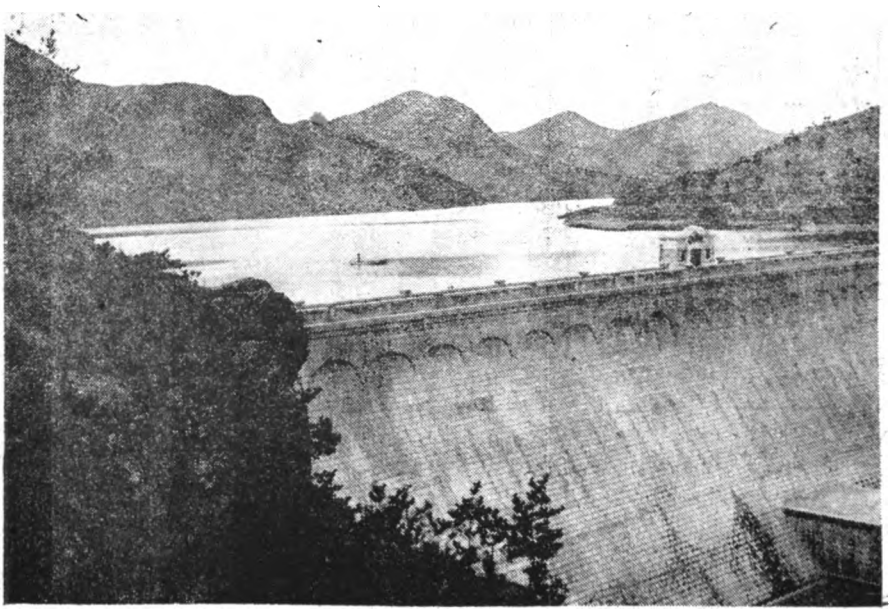
Then, the daily mean amount ranges from 3.5 millimetres to 4.2 millimetres, the daily maximum being 15.3 millimetres.

Compared with other points in Japanese territory, Dairen district is like Taihoku (Formosa) situated in the tropics with the annual mean temperature of 21.7° (that of Dairen being about 10°) and also Fusan (Chosen) which has a warmer climate than Dairen having 13.5° for annual mean temperature. With any other points, the evaporation for Dairen is from twice to at least 120% as large.

As stated above, Dairen and district has only a small amount of annual rainfall, but in respect of evaporation and velocity and frequency of wind, few places in Japanese territory can beat Dairen.

Moreover, in relation to temperature, humidity, etc., the coincidence of the rainy season with the high temperature season makes decidedly against the feeding of a water-source.



GENERAL VIEW OF WANGCHIA
OF THE DAIREN

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In a few words, whilst the rainfall is small, the factors for causing loss to the water available are many and active.

Over and above, Dairen is located at the extremity of a small peninsula, and although there are undulating hills, the region is wanting in broad glens and large rivers. Besides, the rocky structure predominates in its geological formation, and wooded area is preciously small. This feature deprives the locality of the capacity to store the rainwater. At a heavy rain, the rivers will be readily swollen all at once, but will relapse into the shrunk-up condition in a few days' time.

As water is to be had easily everywhere in Japan, little trouble is met with in quest of an adequate water source, as the Tama River is to the City Waterworks of Tokyo, the Yodo River to that of Osaka, and Lake Biwa to Kyoto. This applies also to Nagoya, Yokohama, etc. The only cities that had to construct the impounding reservoirs are limited to a few like Kobe, Nagasaki, Shimonoseki, etc. Even at these places, owing to the plenty of rainfall, the amount of technical

TIEN IMPOUNDING RESERVOIR
WATER WORKS.

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efforts in designing, and the cost required for the construction of the water source were incomparably smaller than at Dairen.

In the West, London draws on the Thames and the Lea; Chicago, Cleveland, etc., on Lake Michigan; Cincinnati, St. Louis, etc., on the Mississippi; Manchester on Lake Thirlmere; Glasgow on Loch Katrine made famous by Scott's "Lady of the Lake." In some cases, an enormous outlay was invested for the necessary installation. Manchester, for instance, had to lay 96 miles of aqueduct, but notwithstanding they have the boon of drawing upon a river or lake.

The use of subterranean water for a water source on account of the excellent quality of water is often commended. We know only to endorse the commendation. But, we might be permitted to take exception to such a line of argument that a subterranean water vein of abundance is certain to be struck anywhere at the depth of from 1,000 ft. to 2,000 ft.

Geologically speaking, the Kwantung Leased Territory belongs to the Palaeozoic group chiefly composed of gneiss and rocks of pre-Cambrian system, which latter consists principally of layers of various kinds of quartzite, quartzite-slate, and clay-slate, etc., overlapping one another, being characterized with the predominance of hard and dense quartzite. Granite rocks traced to the pre-Cambrian Period are found scattered about. There is the least probability of the existence of any water-bearing strata as the source of water for artesian wells. Altogether, the district is a hopeless country for striking a subterranean water vein.

From December, 1912, to July, 1913, a boring was executed at Hsiaokangtzu (Chinese Quarter of Dairen) with Calix rotary core drills, to test whether water can be obtained or not by deep well. It was drilled to the depth of 585 ft. The pains taken was rewarded only by the penetration of the layers of diolite, quartzite, limestone, slate, etc., but nothing like a water bearing stratum. This attests to the hopelessness of obtaining an underground water vein about Dairen.

From the above, the only inference deducible is that, for the extension of the waterworks, which forms a problem of life and death to the growth of the city of Dairen, the surface water, meagre as it may be, must be relied upon. And, unlike other cities in Japan and elsewhere, where natural sources such as rivers, lakes, etc., are available, what may be styled the reservoir system is the only practicable way open. Even in the event of the adoption of the reservoir

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system, the supply capacity will prove comparatively low for the extensive scale on which the reservoir has been built, in view of the moderate rainfall and the active operation of the loss-factors such as evaporation, etc. Moreover, the topographical conditions of the district are such that no catchment basin of a large area can be found. Thus, the capacity of a reservoir must have a limit placed thereon. In consequence, in planning the extension of the existing waterworks in order to meet the rising need of the city of Dairen, it must be admitted to be absolutely impossible to make an ample provision for the generations to come. Such is one of the limitations, from which we can never escape.

In other words, in case of the city of Dairen continuing to expand at the pace kept thereby hitherto, constant effort will have to be used to maintain the waterworks, for one, in an adequate condition.

This point was appreciated by the Kwantung Government (when Lieut. Gen. Baron Fukushima was Governor-General. Ed. *L. of M.*), and an appropriation amounting to ¥1,819,000 was set aside in order to extend the waterworks and to complete the water source of the Malan River as an enterprise extending from 1914 to 1919. This is what is referred to as the second extension programme. Still, there can be no depending on the available supply, granting that the population of the city of Dairen keeps growing. Therefore, as a continuation work from 1920 to 1924, the construction of a new reservoir at Lungwangtang is now in progress, at the total estimated cost of ¥4,680,000. This may be called the third extension programme. That further extensions will have to be executed in the future will be readily understood. Up to the second extension programme (as matters stand at present), the construction work presented no engineering difficulty to speak of, and the requisite cost was also not excessive. But the site of the third extension programme (Lungwangtang) is situated more than fifteen miles west of Dairen. The intervening country is interspersed with chains of hills running in all directions. This renders the execution of construction work especially of the laying of leading main pipe line or conduit very difficult. Again, when at some future time, the fourth extension programme has to be tackled with, the water source will have to be sought no nearer than Chinchou district, and a tremendous sum of funds will have to be laid out.

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We might say that, among the indispensable installations or equipments to Dairen in its dual capacity as city and port, the question of the highest importance that brooks no neglect and at the same time, one attended with the greatest difficulty from both technical and topographical standpoints, is no less than that of water supply.

As dearth of water supply is a serious standing menace to the citizens of the city of Dairen, we are always sounding a warning against waste of water, and, as regards the founding of divers enterprises needing a large amount of water, we heartily recommend that they should be launched at Fushun, Fengtien (Mukden), Liaoyang, etc., where the water source is almost inexhaustible and the fuel producing centre lies within close proximity.

Dairen ought to be dealt with as a city and port, an entrepot of Manchuria and gateway of its commerce.

II. History of Dairen Waterworks.

The Dairen Waterworks was originally designed by the Russians as one of the varied installations requisite to the port and town of Dalny (now Dairen) and the railway, when they leased Liaotung Peninsula from the Chinese Government and planned to construct a commercial port at Dairen in 1901.

The Russian plan had not yet been completely executed when the Dairen Waterworks passed into the Japanese hands.

What was designed by the Russians was only an improvised affair on a very small scale.

It consisted of the following:—

Eight wells lined with stone, each 20 ft. in diameter and about 20 ft. deep, were sunk in the Malan River at South Shahokou at nearly 4 miles west of the city of Dairen in order to gather the underground flow in the gravel layer. The water so gathered was pumped and transmitted through 6 inch piping by two Washington pumps, each of about 18 horsepower, to the service reservoir on Fushimidai Heights, at the altitude of about 190 ft. above the sea level, to be distributed to the Railway Administration Quarter (now called Roshia-machi) and the locality about the Railway Station.

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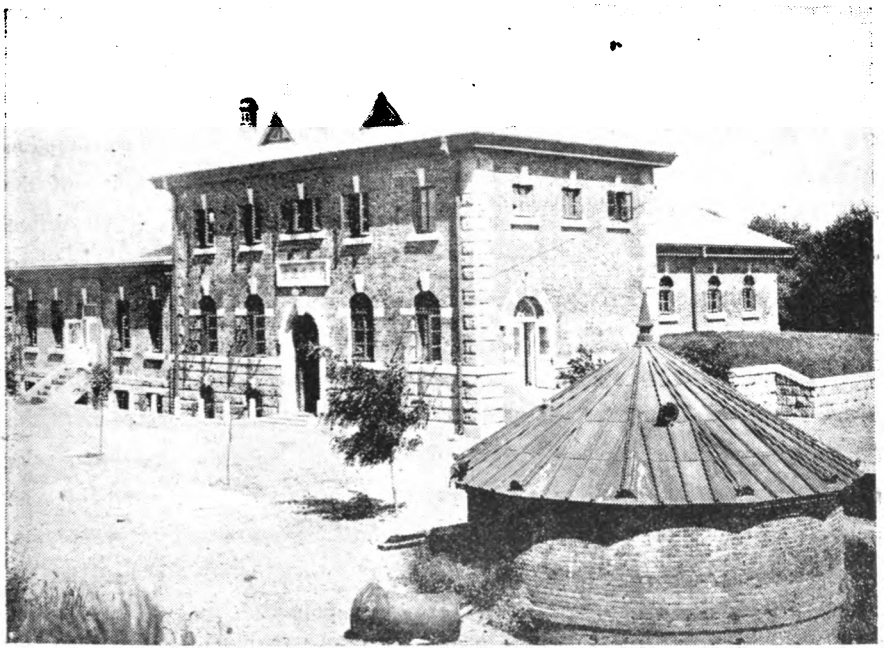
Further, two wells were sunk in Higashi-Koyencho (at the east of the South Manchuria Railway Company's General Offices). This is known as "Waterworks No. 2" which has subsequently been transferred to the management of the Railway Company. The water of this waterworks is supplied to the Dairen Harbour and also the Railway Station.



VIEW OF RAPID FILTER PLANT AT SHAHOKOU.

The maximum capacity of the above waterworks was only 1,000 tons at Shahokou and about 100 tons at "Waterworks No. 2."

Therefore, in October, 1905, the first extension programme was drafted. Work was put in hand in the following year (1906) at the estimated outlay of ¥1,060,000. It was completed in March, 1910.

This extension work involved the construction of a blind dam at the Shahokou Watersource and of a new settling reservoir and a filter bed, the installation of a new pumping station, the laying of a 16 inch forcing main pipe from Shahokou to the service reservoir, Fushimidai, and the construction of a new service reservoir at Fushimidai, together with the laying of the distributing main and branch pipes.

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(Reference is invited to Chapter III). The items of the greatest urgency were taken up before the rest, and even prior to the completion of the construction work, the public began to be supplied through the newly laid forcing and distributing pipes in February, 1908.

As the city of Dairen grew, the supply from the street hydrants, not to speak of the private taps, increased steadily in the number of the clients and also in the quantity of consumption.

In July, 1911, a restriction had to be placed on the hours of daily water supply from the 3rd to the 13th. By July, 1912, the daily maximum consumption reached 6,100 tons, which was close to the limit of the supply capacity of the waterworks then existing. On the other hand, the rate of increase of the population of Dairen did not increase at some fixed rate of geometrical progression, as at so many cities in Japan and the Western countries. The rate of increase varied according to years, as might be expected of a new colony.

The population of Dairen at the end of 1907 showed an increase over the figure at the end of the preceding year by about 20,000; at the end of 1908, the increase over the previous year exceeded 8,000; since 1909, a somewhat regular pace of increase has been observed yearly, the annual increment ranging between 2,000 and 6,000. At the end of 1913, the yearly increase rose to about 10,000. At all events, the general situation of South Manchuria seemed to endorse the anticipation of a rapid growth in population at Dairen. The urgent necessity of extending the Waterworks further was recognized. Under these circumstances, the Second Extension Programme was drawn up and was started as an undertaking extended over six years from 1914 to 1919.

On April 5, 1914, preparatory work was commenced on the site of the new reservoir at Wangchiatien, and excavation work was begun on the 25th of the same month. The construction of the reservoir was finished practically on August 26, 1917.

Before the completion of the work, in July, a heavy rain raised the water to the depth of 60 ft., and the construction work was pushed forward with concentrated energy day and night. By August 21st, the water of the reservoir went up to 73 ft. in depth, and the overflowing water created a large waterfall of 40 ft. in height over the steep cliff. The roars of the rolling, water, with its whirls, bubbles,

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and sprays, presented a splendid sight. The laying of a leading main pipe line of 20″ dia. from the reservoir to the filtration plant (淨水場) at Shahokou, the reconstruction of part of the settling basin as coagulation basin, the installation of new filtering appliances, the removal and installation of pumps, and the equipments for distributing water to the higher levels at Dairen were executed as expected, and by the end of 1919, by which time the construction work was to be finished, the whole of the principal parts of the work had been finished. The other minor parts, inclusive of the laying of the service pipes in the city, had been completed by the end of March, 1921, as planned at the outset.

Prior to the commencement of the Second Extension Work, above mentioned, what with the increase of the water consumption from about 1913 and what with insufficiency of rainfall, a water famine began to be threatened, and the partial suspension of water supply had to be enforced:

Firstly, from November 11, 1913, to March 14, 1914;
Secondly, from June 11, 1914, to July 4, 1914;
Thirdly, from November 13, 1915, to May 31, 1916;
Fourthly, from October 20, 1916, to July 31, 1917.

In the last mentioned case, the partial suspension extended over nine months at a stretch to the untold misery of the citizens.

The authorities concerned were not idle or resourceless. They managed to draw some supply from Tayukou near Liushutun across the Dairen Bay by means of water boats. Then, more supply was obtained from Ryojun (Port Arthur) in railway tank cars to fill the need of the locomotives. The effort of the authorities to make the best of the trying situation is worthy of special recognition in the annals of the Dairen Waterworks.

Since the completion of the Wangchiatien reservoir (according to the Second Extension Programme) which can hold 5,400,000 tons of water, the daily water consumption of the city of Dairen has kept increasing at a faster rate than before, but so far not a sign of a water famine has yet been seen.

Dearth of water from 1916 to 1917 was without a parallel. It was owing to the extraordinary drought extending from 1915 to 1916, combined with the sharp rise of water consumption due to the rapid increase of the Dairen population.

The Second Extension Work, then in progress, could not be of any use before 1918, by which year the water of the new reservoir was expected to be sent to the

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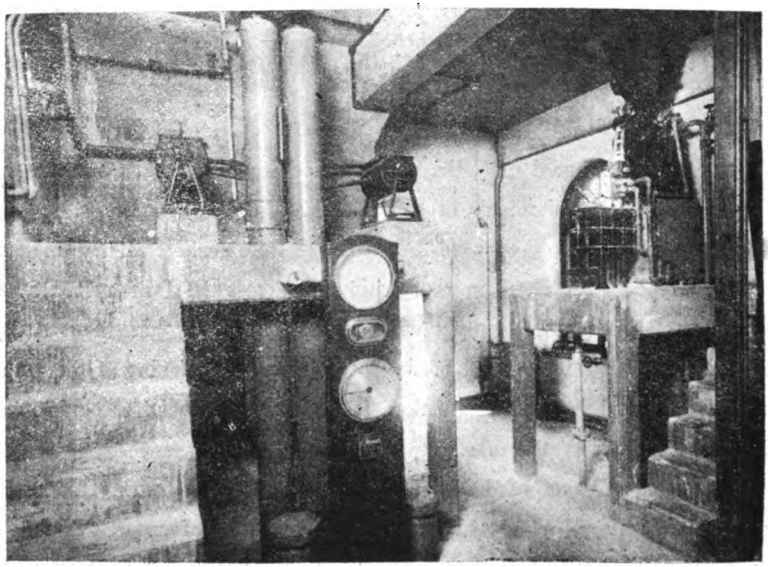
Shahokou filter plant. Accordingly, the authorities, as an expediency, decided to found a new source at Lanchiatun (near Hsiaopingtao) at nearly 8 miles west of Dairen with the object of keeping it as an auxiliary source of supply. So, in November, 1916, when the cold winter was literally at the threshold and even all kinds of outdoor building work have to be suspended, the work was started, and, in spite of the inclement weather, it was pushed on with admirable fortitude, being brought to completion on March 10, 1917. This is what is styled "Auxiliary waterworks at Lanchiatun." It cost ¥180,000.

The above, that is, the First and Second Extension Works, with the Lanchiatun Auxiliary waterworks, make up the existing waterworks installations. Their dependable supply capacity consists of 10,000 tons by the Wangchiatien reservoir and 2,000 tons by the Shahokou wells, which formed the First Extension Works



AUTOMATIC LIME DRY FEEDING MACHINE AND AUTOMATIC CHEMICAL SOLUTION FEEDING APPARATUS OF THE RAPID FILTER PLANT.

(originally the estimated supply capacity was 6,100 tons a day, but the data during the dry season put 4,000 tons as a reasonable daily capacity. Since the completion of the Wangchiatien reservoir, the catchment area of the wells has been cut down by half), in addition to 600 tons by the Lanchiatun waterworks.

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Calculating the per capita per diem consumption at 4.5 cub. ft. for a White and a Japanese, and that for a Chinese at 1 cub. ft., the present installations suffice for 60,000 Japanese and Westerners and as many Chinese, still leaving 3,435 tons for supply to the Harbour, Wharves, locomotives, the Workshops, street sprinkling, fire-extinguishing, fountains, etc.

Such is a brief history of the Dairen Waterworks and the present supply capacity.

Is this supply sufficient for the present Dairen? How much longer will the same supply prove adequate? These are questions of much importance claiming intelligent handling.

The following is a table giving the rate of increase of the population of the city of Dairen and district within the supply area of the Dairen Waterworks:—

Table 4.

	At the End of					
	1906	1907	1908	1909	1910	1911
Households:						
Japanese	1,993	4,791	6,615	7,000	7,580	8,797
Chinese	3,038	3,380	3,602	3,781	3,188	3,993
Foreigners	6	23	22	33	39	41
Total	5,037	8,194	10,239	10,751	11,437	12,831
Population:						
Japanese	8,248	16,688	21,593	22,877	26,022	29,775
Chinese	10,601	14,582	17,561	17,882	19,755	21,032
Foreigners...	23	54	54	85	89	96
Total...	18,872	31,324	39,208	40,844	45,866	50,903
	Increase or Decrease against preceding year					
Households:						
Japanese	—	2,798	1,824	385	580	1,217
Chinese	—	342	222	116	100	175
Foreigners	—	17	1	11	6	2
Total...	—	3,157	2,045	512	686	1,394
Population:						
Japanese	—	8,440	4,905	1,284	3,145	3,753
Chinese	—	3,981	2,979	321	1,873	1,277
Foreigners...	—	31	—	31	4	7
Total...	—	12,451	7,884	1,636	5,022	5,037

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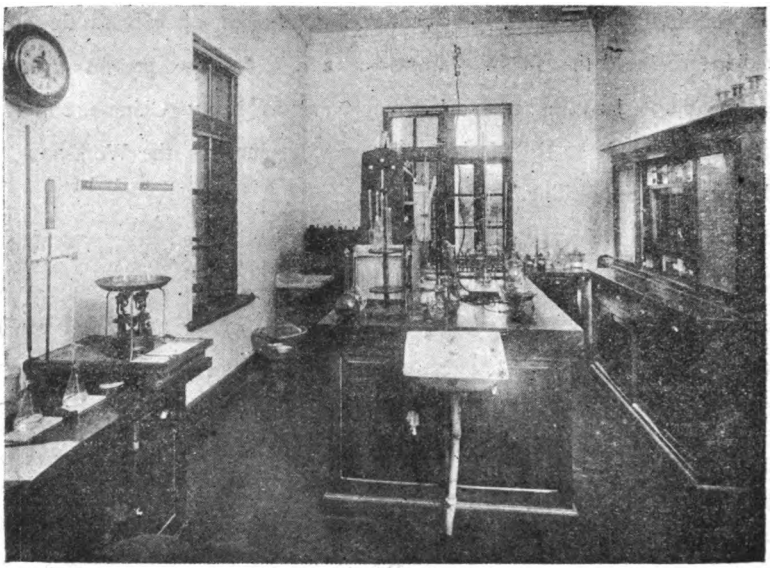

INTERIOR OF THE LABORATORY FOR THE EXAMINATION OF WATER IN THE RAPID FILTER PLANT.

	At the End of					
	1912	1913	1914	1915	1916	1917
Households:						
Japanese	9,145	9,521	9,778	9,866	10,239	10,195
Chinese	4,845	5,742	5,789	6,240	6,783	10,434
Foreigners	47	38	40	45	29	31
Total...	14,037	15,301	15,607	16,151	17,051	20,660
Population:						
Japanese	32,885	35,439	37,312	38,438	40,485	40,730
Chinese	22,908	36,963	36,018	42,466	46,570	60,928
Foreigners...	95	82	94	116	69	95
Total...	55,888	72,483	73,424	81,020	87,124	101,753

	Increase or Decrease against Preceding year					
Households:						
Japanese	348	376	257	88	373	44
Chinese	851	897	47	451	543	3,651
Foreigners	6	9	2	5	16	3
Total...	1,206	1,264	306	544	900	3,610
Population:						
Japanese	3,110	2,554	1,873	1,126	2,047	245
Chinese	1,876	14,054	944	6,448	4,104	14,358
Foreigners	1	13	12	22	47	26
Total	4,985	16,595	941	7,596	6,104	14,629

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	At the End of		
	1918	1919	1920
Households:			
Japanese	11,641	12,598	14,157
Chinese	12,097	12,964	16,690
Foreigners	26	23	34
Total	23,764	25,585	30,881
Population:			
Japanese	48,209	53,559	61,120
Chinese	75,639	82,769	125,407
Foreigners	89	77	118
Total	123,937	136,405	186,645

	Increase or Decrease against Preceding year		
Households:			
Japanese	1,446	957	1,559
Chinese	1,663	867	3,726
Foreigners	5	— 3	11
Total	3,104	1,821	5,296
Population:			
Japanese	7,479	5,350	7,561
Chinese	14,711	7,130	42,638
Foreigners	6	— 12	41
Total	22,184	12,468	50,240

From the above table, it is plain that the rate of increase of the population varies widely according to years, ranging from 50,240 people to a little over 900 people a year. That during the recent few years, the annual increase has risen to between 10,000 and over 50,000 people may be ascribed in part to the economic inflation brought about by the world war, but at the same time, it may give an idea of the rapid growth of the city of Dairen.

Below, a table showing the rates of annual increase in population at the end of each year over those of the previous one is appended:—

Table 5.

	1907	1908	1909	1910	1911	1912	1913
Rate of increase of Japanese to Japanese population	1.022	0.294	0.059	0.137	0.144	0.105	0.078
Chinese to Chinese population	0.379	0.204	0.018	0.104	0.065	0.089	0.614
Japanese to Whole population	0.659	0.252	0.042	0.123	0.109	0.098	0.297

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Rate of increase of	1914	1915	1916	1917	1918	1919	1920	average
Japanese to Japanese population	0.050	0.030	0.053	0.065	0.183	0.110	0.141	0.177
Chinese to Chinese population	0.025	0.179	0.097	0.308	0.243	0.010	0.514	0.208
Japanese to Whole population	0.013	0.103	0.077	0.175	0.218	0.100	0.368	0.186

The above will prove how fickle and variant the rate of increase has been, particularly in the case of the Japanese and the Chinese population separately. However, the average rate of increase for the past fourteen years, both Japanese and Chinese being put together, has been 18.6%.

Since the Kwantung Government foresaw the destined development of the city of Dairen and conceived the plan of expanding the city from 1918, and published it in June, 1919, energetically working for the execution of the same, some 1,000,000 *tsubo* of reclaimed area has been added to the inhabited part of the city. The building of new business houses and residences has kept pace with the wonderful expansion of the inhabited area. Now, the city is about to get adjoined to Shahokou, where the South Manchuria Railway Workshops are located, and Taishanchien, at the foot of Dairen Fuji (so named because of the hill looking like the famous Mt. Fuji when seen from Nippon Bridge, Dairen).

Consequently, the water consumption of Dairen has increased at a bound since 1918. The daily average for the month of July, 1920, was 13,290 tons, the highest figure for the same month being over 15,000 tons, quite exceeding the then supplying capacity of the Waterworks.

Such a phenomenon will be nothing to be wondered at, when one takes note of the fact that, at the end of 1920, the Japanese and Foreigners residing in the city numbered 61,238 in addition to 125,407 Chinese, totalling 186,645 in all.

Timely Provision for Future.

As the Second Extension Programme made good headway in 1918 and the water supply condition was put in a satisfactory state, we could not help seeing that even the completion of the Programme would soon prove inadequate to meet the

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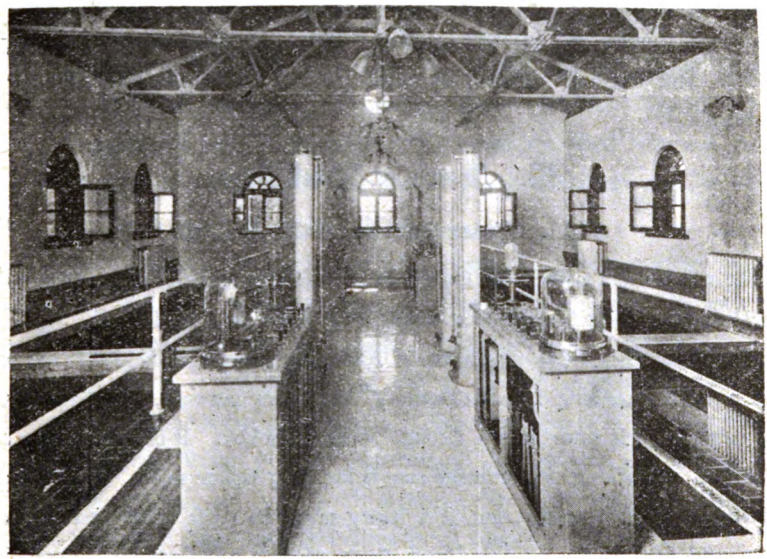
fast rising requirements, and therefore we stressed on the urgent necessity of starting without delay the work on the Third Extension Programme, and we were fortunate enough to enlist the hearty endorsement of the Kwantung Government. It was informally agreed to ask for the necessary appropriation of the Central Government.

The above result of computation will be found to be on the level with that obtained on the basis of the rate of increase of population, demonstrating that the supply available at that time will fall short of the purpose four or five years later (or by the end of 1921 or 1922).

We tried to pry into the needs of the future on the basis of numerical figures. But, the water consumption is materially affected by the rise and fall of the industrial enterprises and also of the shipping trade of the port of Dairen.

It was then in the War time, and a hundred and one industrial ventures were springing up one after another, indicating a remarkable demand for water supply from this very source. This consideration emphasized the necessity for an early extension all the more.



INTERIOR VIEW OF THE FILTER ROOM, SHOWING FILTERS, OPERATING TABLES, & CONTROLLERS, TOGETHER WITH PLATFORM.

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Under the above circumstances, the Third Extension Programme was drawn up in 1918, and in the following year (1919), the necessary appropriation was asked for of the Imperial Diet, which was unfortunately dissolved, leaving the appropriation asked for unendorsed.

In summer of 1920, in which an extraordinary session of the Imperial Diet was convoked, the question of the Dairen Waterworks extension, having a vital bearing upon the welfare of Dairen, permitted of no further delay, and therefore the proposition was laid again before Parliament, which duly confirmed the same. The new enterprise is to be completed in the course of five years from the fiscal year of 1920 to that of 1924. The total estimated cost is ¥4,681,380.

The authorities concerned, it will be seen, have been doing everything possible to ensure an adequate water supply. But, the population depending upon the Dairen Waterworks has increased to more than 180,000, in excess of the reasonable expectations. The daily consumption, too, reached over 15,000 tons, the highest daily figure, which was attained in July, 1920. Through the favourable rainfall condition, which was purely accidental, the water supply could be barely maintained.

Therefore, I should like to sound an appeal to the citizens of Dairen in general that, pending the completion of the Third Extension Programme, they will observe a strict economy of water so as to ensure the dependability of the local water supply.

III. Sketch of Installations.

(A). Water Source in the Malan.

The main water source of Dairen Waterworks is located in the Malan River running through West Shahokou at nearly four miles west of Dairen.

The Malan River has its source in Antzuling Mountain, held as the second highest in the Kwantung Leased Territory, and flows eastward, then turning to the south, empties itself into the sea through South Shahokou. It is a small river and is about fifteen miles long, its drainage area being 37.5 square miles. In dry weather, the river has but little water, but at a heavy rain, the swift murky current is very often several feet deep. In this River, there are two water sources: one, in the form of the impounding reservoir at Wangchiatien, and the other in the form of the wells at South Shahokou.

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Wangchiatien Reservoir.

The Wangchiatien Reservoir constitutes the principal source of supply to the Dairen Waterworks and is situated at Hanchiatun, part of Village Wangchiatien, at 11⅓ miles northwest of Dairen.

This Reservoir was constructed, as above stated, on the principle of depending upon the reservoir system alone for a steady reliable supply.

In order to determine the size of a reservoir, it is necessary to conduct a minute investigation regarding the rainfall in the drainage area, together with the evaporation, percolation, and actual run-off. Accordingly, in June, 1911, a temporary observatory was founded at Chakou, in the centre of the catchment basin, in order to conduct observations of all these natural data in addition to what had been carried on at the Meteorological Observatories at Ryojun (Port Arthur) and Dairen. Moreover, between May, 1911, and May, 1913, a weir was constructed at Shahokou for the purpose of measuring the amount of ground water flow and, at the same time, we calculated the amount of subsoil flow by the quantity of water pumped up to the settling reservoir of the waterworks by the intake centrifugal pumps.

Thus, the actual flow of both surface and subsoil run-offs, at Shahokou, was measured, and also on the site of the new dam under contemplation, another water-guage weir was constructed. At the time of a freshet, the flood flow was measured actually. A minute survey was carried out of the catchment area to the new reservoir from May, 1911, to August, 1912.

Generally speaking, the co-efficient of discharge, i.e., the percentage of run-off to the total rainfall in a catchment area, will vary with many factors such as the season, frequency and intensity of rainfall, velocity of wind, and humidity of air or of ground. So, it is difficult to find out a rational co-efficient which applies to all conditions of the influencing factors. Therefore, there will be only two ways to determine the co-efficient (1); by determining the monthly co-efficients by the long period observation or (2) by determining the co-efficient according to the amount of rainfall in some specified duration of time.

In our case, the results of the actual observations showed that, in case of the monthly run-off being considered, it varied most remarkably according to the

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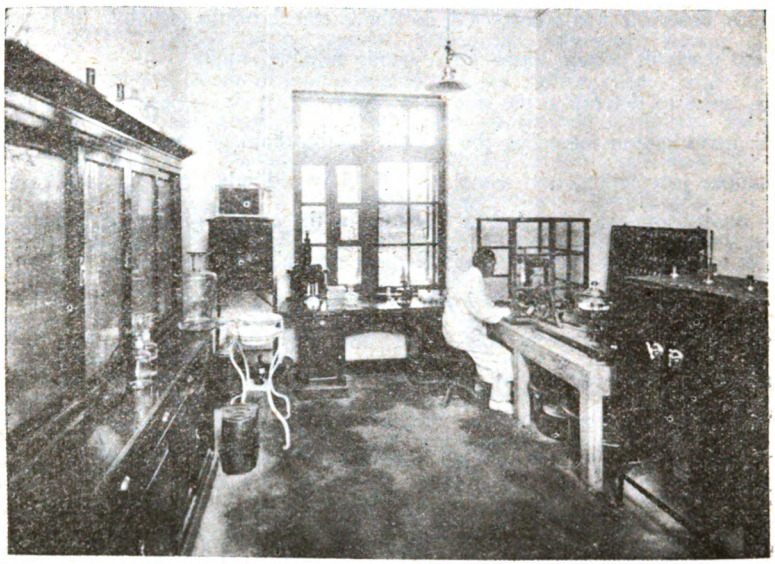
quantity of rainfall during the month. A curve showing the relation of monthly run-off and rainfall was obtained by an analytical study of the results of the above observations. These rates of run-off were used, in their turn, as the basis for calculating the quantity of the water that has flowed into the reservoir from the



INTERIOR OF THE LABORATORY FOR EXAMINATION OF WATER IN THE RAPID FILTER PLANT.

catchment area during the past several years. From this amount the evaporation amount was deducted (the leakage and percolation amounts were left out of account on the assumption that there was some allowance left in the evaporation amount).

The results of these calculations were shown on a diagram, and by what is called the yield curve method, the dimensions of the reservoir in project were determined, taking into consideration the topographical features of the proposed site for the reservoir.

The dam of the new Reservoir was constructed at the neck of the Wang-chiatien dale where the spurs of the two hills embracing the dale slope down nearest each other, and is situated at a distance 7 miles from the Shahokou filter and pumping plants.

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It is built of rubble-concrete and of gravity section, and in plan, it forms an arc having a radius of 1,742½ ft. in order to give it an additional strength beyond calculation, to be in harmony with the topographical features, and also to abut it to the solid rocks at both ends. The rocks at both ends of the dam, to which it abuts, are formed of quartzite of considerable hardness. The gentle slope on the left bank is availed of for the construction of both the overflow and overflow channel, which latter discharges the waste water from the precipitous cliff, some 300 ft. distant from the dam, down into the river. At about the middle of the main body of the dam (the overflow portion being excepted), an intake tower is constructed.

Within the tower, a 22 inch cast iron pipe is erected and, by means of four 10 inch branch pipes, which project out of the tower at the interval of from 14½ feet to 16 ft., the water is conducted to the leading main pipe. The leading main pipe has the diameter of 22 inches while in the dam, being reduced to 20 inches outside the dam. The drain pipe is 24 inches in diameter, and is installed against emergency. Both the leading pipe and drain pipe are laid in the pipe gallery to facilitate inspection.

In the part of the main body of the dam adjoining the overflow portion, a projection of 6 ft. each, both above and below the dam, the total width at the top of the dam being 22 ft. with 20 ft. in length, is made. On the down stream side of this projection, a flight of steps is made down to the river bed. This is intended, in addition to necessity, to enhance the appearance and, at the same time, to reinforce the strength of the dam.

The following is the dimensions of the dam and the reservoir:—

a) Dam.

Length (overflow portion being excepted)	707.46 ft.
Height, maximum (depth of trench not being included) ...	96.00 ft.
Width at top...	11.50 ft.
Width at bottom, maximum...	67.43 ft.
Superelevation	5.00 ft.
Top of dam (above sea level)	282.00 ft.
Volume of the body of dam (1 *tsubo* being equal to 216 cub. ft.)	5,545 *tsubo*

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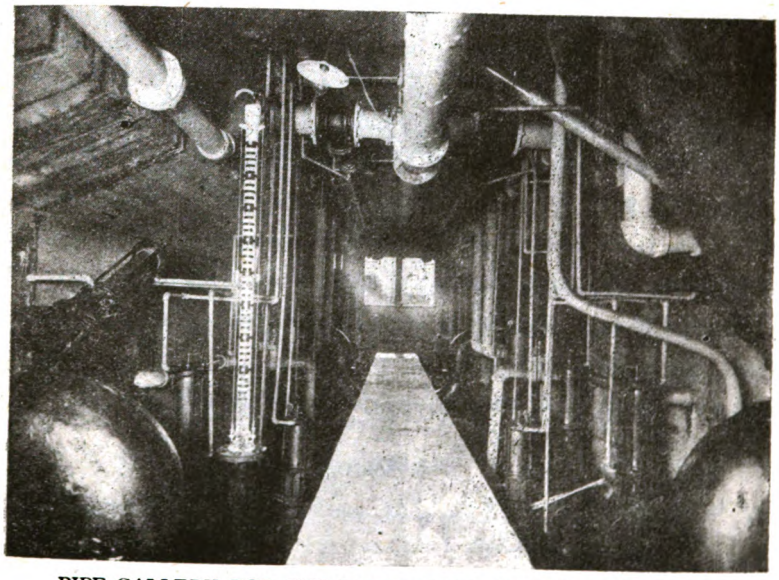
b) Over-flow Length.

(of which 84 ft. being the overflow portion of the main dam and the remaining 298.3 ft. being the length of the overflow weir specially made, projecting into the reservoir on the left bank.)

Reservoir.

Catchment area (1 sq. *tsubo* being-equal to 36 sq. ft.)	9,435,790 sq. *tsubo*
Storage capacity (available)	5,348,883 tons
Storage space (maximum)	204,364 *tsubo*
Maximum altitute of water (above sea level) ...	277 ft.
Maximum depth of water	73 ft.
Effective depth of water...	63 ft.
Altitude of lowest bed of Reservoir	204 ft.
Length of reservoir	9,900 ft.
Greatest width of reservoir	900 ft.
Circumference of reservoir	5½ miles
Number of houses removed, which would have otherwise been sunk into the reservoir	30 houses



PIPE GALLERY FOR THE RAPID FILTERS UNDERNEATH THE PLATFORM.

The top width of the dam is 11½ ft. On the downstream side, it is perpendicular for the length of 13 ft. from the top; for 9.3 ft. further down, it

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makes a circular segment of 30 ft. in radius, and for 6.4 ft. below it slopes at the grade of 59/100 and the remaining part at the grade of 69/100. The up stream side is vertical down to 29 ft. from the top; for 20 ft. further down, the gradient is 6/1000; and for the remainder down to the foundation rock, the gradient is 2/1000.

At the bottom of the up stream side of the dam, a cut-off trench, 10 ft. wide and 10 ft. deep, is constructed. The down stream side is faced with concrete blocks, of the proportion of cement 1, sand 2, and gravel 4. The blocks are of two kinds—one being 1.2 ft. square and 2 ft. thick, and the other being 1.2 ft. high, 2.4 ft. long, and 1.2 ft. thick. Along the top, the facing blocks are fashioned in the shape of series of arches for ornamental purposes.

On the upstream side, for the depth of 40½ ft. from the top, granite blocks of 1 1/5 ft. square and 2½ ft. in thickness are used, and for the rest, concrete blocks are used as on the downstream side.

These granite stones are used to provide against the freezing action of water, as well as against the shocks which might be received from some floating objects in case of inundation and violent wind. The thickness of joints is half an inch, the mortar used being of 1.2.

In the lower portion of the body of the dam, the rubble concrete is of the proportion of 0.5 cement, 0.4 pozzuolana, 0.1 lime, 2.5 sand, and 5 gravels, being further mixed with rubble stones, weighing from almost 17 lbs. to 83 lbs. each and measuring from 7 inches to 2 ft. to the extent of about 25% of the whole mass of the made-up rubble concrete.

In the upper part the concrete is made by mixing 0.8 cement, 0.15 pozzuolana, 0.05 lime, 2.5 sand, and 4.5 gravels, the sizes and weights of the stones added being the same as in the preceding case.

The temperature in Dairen district varies from about 30° C. (the highest in summer) to 15° below zero C. (the lowest in winter), the range between both extremes being 45° C.

Therefore, it is probable that even a massive structure as the dam will expand or contract and will cause temperature cracks, and this phenomenon will be more remarkable than in the mild climate as in Japan.

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Such temperature cracks are only natural phenomena and are quite impossible to be avoided. Still, even if such phenomena should occur, unless they be of a very serious nature, it would not detract from the strengh of the dam.

However, in a district such as about Dairen, which has excessive heat and cold, it was deemed necessary to make some suitable provision. Therefore, the contraction joints are provided, the first undertaking in Japanese masonry dams. Such joints number five in the principal part of the dam besides two more in the overflow portion, totalling seven. The distance between any two successive joints is about 90 ft. By means of these joints, the body of the dam is absolutely divided vertically. The contact surfaces of each joint have a thin coat of asphalt, laid thereon, so as to prevent adhesion, thereby giving no resistance to expansion and contraction.

Then, a couple of copper strips are kept inserted across the contact surfaces of each joint along the longitudinal axis of the dam, or at a certain angle thereto, to cut off the leakage of water through the joints.

The passageway on the top of the dam is 8.7 ft. wide, hemmed with a line of breastwall made in concrete, 3 ft. high, on either side. At each edge of the passageway runs a drain, 4 in. wide and 2½ in. deep.

The bottom of the intake tower stands on the same level as that of the reservoir itself. It is 14 ft. from the bottom to the rocky foundation. The tower is semi-circular in shape, with a radius of 7 ft., and its inside face is vertical. On the outside it gently tapers upward at the rate of about 38/1000. The wall is 6 ft. thick at the bottom and 3 ft. thick at the top.

The outside is made of granite, 1½ ft. or 1 ft. thick, 1 1/5 ft. high, and with varying widths; whilst the inside is built of stone, 1½ ft. or 1 ft. thick and 1 1/5 ft. square with the use of 1.2 mortar, the space between both facing stones being filled up carefully with concrete made of 0.8 cement, 0.15 pozzuolana, 0.05 lime, 2.5 sand, and 4.5 gravels. On the top of the tower, a valve operating chamber is made of brick with a floor made in reinforced concrete, half a foot thick.

Four head stocks for opening and closing the valve are fitted with. The drain pipe projects out of the intake tower, and is surrounded with a wall, 10 ft. and 8 ft. long on the sides and 6 ft. high from the bottom of the reservoir, so that the accumulation of mud at the bottom may not fill up the drain pipe.

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The overflow made at the left bank end of the body of the dam is faced with granite cut stone. The front overflow weir (constructed specially) is made of rubble concrete with rubble facing, having a contraction joint at the interval of 60 ft.

CHEMICAL SOLUTION TANKS IN THE RAPID FILTER PLANT.

The overflow channel for the overflow weir is from 32.7 ft. to 58.5 ft. wide, with the bottom thereof slanting at 1/100. The foundation concrete is 1½ ft. thick, with a stone facing 6 inches in thickness. From the point, at which the overflow water from the side overflow weir adjoining the body of the dam joins the water from the front overflow weir, the overflow channel takes the width of 156 ft. to 94.5 ft. With regard to the longitudinal slope, it is 1/30 in the middle and 1/55 on either side. It is also made of foundation concrete, 1½ ft. thick with a stone facing, 6 inches in thickness.

Transversally it inclines from either bank towards the middle at the mean gradient of 1/50, so as to gather the flow to the middle. It terminates at the exposed cliff on the river bank which is 48 ft. high above the river bed.

The geological character of the locality about the dam belongs to the Palaeozoic stratum of the Cambrian Period and consists of siliceous rock of dark and white colours and Phyllite of dark blue colour. On the left bank, the siliceous stone is overlapped with phyllite, or thin layers of phyllite lie between the siliceous rocks.

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The substratum of the river bed is made up of hard silicious rock, with phyllite showing an undulating exposed surface on the top. On the right bank, phyllite intervenes in siliceous rock.

The Malan River Valley is one of the great dislocations in the Kwantung Leased Territory, and the River itself is a trench formed by the same dislocation.

On this account, on the site of the dam, there is a fault on either bank, the one on the right bank being small and the other on the left somewhat larger.

These faults were created simultaneously with the main dislocation, and both run in the same direction as the river course. There exist a few other minor faults. The silicious rocks, too, have fissures running vertically and horizontally.

The geological structure being such, absolute impermeability can hardly be expected. Therefore, great care was exercised in carrying out the construction work. Especially, in the dislocated part, special provisions were made.

The stability of the dam was computed with the specific gravity of 2.25 or 140.4 lbs. per cubic of masonry. The greatest stress on the toe of the dam is 6.04 tons per square foot, and the vertical stress on the heel is 5.5 tons, both being within the safe limit of the bearing power of the foundation.

The principal auxiliary works to the Reservoir include, first of all, the construction of a new road along the bank of the Reservoir.

The dale forming the Reservoir is situated on the so called middle road between Dairen and Ryojun (Port Arthur). A new road had to be constructed along the hillside on the left bank, starting from a point about 400 yards below the dam. This road is 4,400 yards long, and contains a bridge, 90 ft. long, built in reinforced concrete, besides four culverts. In order to prevent gravels, sand and earth from flowing into the Reservoir, two weirs in the main stream and four in the branch streams were built above and outside the reservoir.

The land area purchased in connection with the construction of the Reservoir comprised 140,146 *tsubo*. The Chinese houses caused to be removed numbered 25 containing 52 households. There were 53 grave mounds and 1 temple which had to be also removed.

Moreover, at about 120 ft. below the dam, a meter house to the leading main pipe was built, furnished with a Simplex Venturi meter so as to measure the quantity of water sent to the filter plant at Shahokou.

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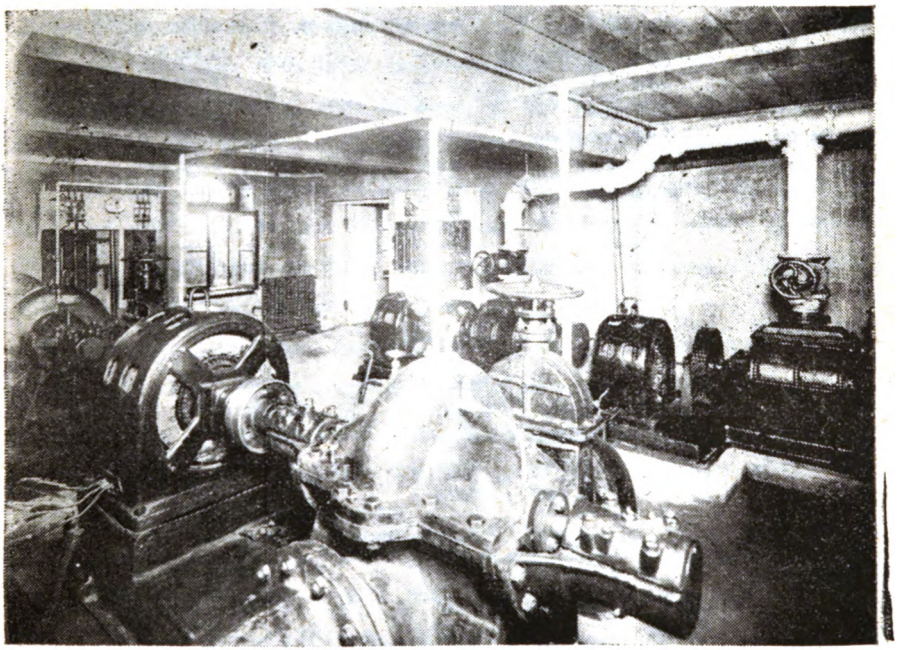
The initial preparations for the construction work were taken in hand on April 5, 1914. On the 21st of the same month, the excavation of the ground was begun. During the same year, the part of the concrete works was executed up to November, after which the concrete work being impracticable, stones, ballast, etc., which could be gathered in the neighbouring localities, were procured against the resumption of work on the return of spring. As soon as weather permitted, the work was taken up again, and during the busiest period, four concrete-mixers, one mortar-mixer, one pump for the supply of water necessary for the work, and several drainage pumps were used, while from 600 to 700 workmen and coolies



ELECTRIC DRIVEN AIR BLOWERS AND CENTRIFUGAL PUMPS FOR CLEANING THE BEDS OF RAPID FILTERS.

were employed. The work was practically finished on August 26, 1917, and by 11.30 p.m. on the same day, the new Reservoir was filled with water. The overflow was gradually commenced, and the object of the construction was realized in a full measure.

The remaining details were completed entirely in the latter part of November.

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From April 5, 1914, on which the preliminaries were taken in hand for the first time, three years and seven months intervened till the successful consummation of the work. The actual working days numbered 1190. The total outlay amounted to ¥477,501.

Below a table of the materials and labour employed is given :—

Materials.

		Price unit	Value	
Cement	35,666,985 barrels	¥2.939	¥104,815,381	
Pozzuolana	427,580,504 *kuan*	0.298 per 10 *kuan*	12,736,510	
Lime	67,122,010 „	0.325 per 10 *kuan*	2,180,394	
Sand, cleaned ...	2,747,595 cub. *tsubo*	—	22,117,867	Under direct management of the Government.
Stone, cracked ...	4,790,641 „	—	15,707,135	
Rubble stone	4,074,952 „	—	9,001,490	
Granite, cut.	8,927,000 pieces	0.933	8,326,080	
„ , copestone ...	1,212,000 „	2.357	2,856,840	
„ ,...	11,440,000 „	0.407	4,655,200	
Sundries	—	—	59,192,678	
Total	—	—	¥241,589,575	

Labour

		Wage unit	Total	
Japanese workmen	18,152.380	¥1.091	¥19,800.097	
Japanese labourers	9,812.202	0.756	7,416.273	
Korean coolies	4,934.200	0.651	3,210.615	
Chinese coolies	357,124.350	0.283	101,066.760	
Total	390,023.132	0.337 (average)	131,493.745	
Japanese skilled labour ...	7,230.720	1.462	10,568.107	
Chinese skilled labour ...	11,362.490	0.633	7,187.287	
Total	18,593.210	0.995 (average)	17,755.294	
One-horse carts	107	1.021 each per day	109.250	
Double-horse carts	636	1.972 „	1,254.630	
Total	743	1.836	1,363.880	
Grand total			156,613.019	
Nationalities of labour				
Japanese	40,129.502	1.022	40,995.092	(inclusive of Koreans)
Chinese	368,486.840	0.294	108,254.047	
Total	408,616.342	—	149,249.139	

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Conducting Pipe.

The pipe line running from the Reservoir to the filtration plant at Shahokou is 12,000 yards in length and is made of iron pipes, 26 inches in diameter. The water is sent by gravitation and the maximum daily capacity is 18,000 tons, being 7½ cubic feet per second.

B. Water Source at Shahokou.

The water source at Shahokou was, as already stated was, executed according to the Initial Programme. Out of the eight wells sunk by the Russians in the Malan River, each 20 ft. in diameter and 20 ft. in depth, four were found in a serviceable condition with more or less improvement. Below these wells, a blind dam was constructed across the River bed in order to intercept the underground flow and to raise the level of the ground water which is collected into the wells.

The river bed in these neighbourhoods consists of a layer of gravels, from 20 ft. to 30 ft. in depth, and the underground flow filtering down, was no less than 220,000 cubic feet (or 6,100 tons), according to the Russian record. It was intended to make most of the above available.

This water source, from the experience had during the water famine in 1917, may be considered to give a safe natural flow of 4,000 tons per day.

Moreover, by the completion of the Wangchiatien Reservoir, half the drainage area of this water source has been lost, and 2,000 tons a day may be put down as a reliable supply from this source.

The blind dam is 1,680 ft. long, and reaches down to the rocky foundation at the depth of from 8 ft. to 30 ft. made of clay and concrete. On the top it is 3 ft. in width, and it broadens as it goes lower into the ground with a series of steps.

On the upstream side of the weir, a conduit, 4 ft. wide and 6 ft. high, was provided.

Each well is connected with 6 in. iron pipes, and the underground flow accumulating in the wells and conduit is sent down to the suction well by means of 14 in. pipes, and is raised to the settling reservoir by the intake centrifugal pumps.

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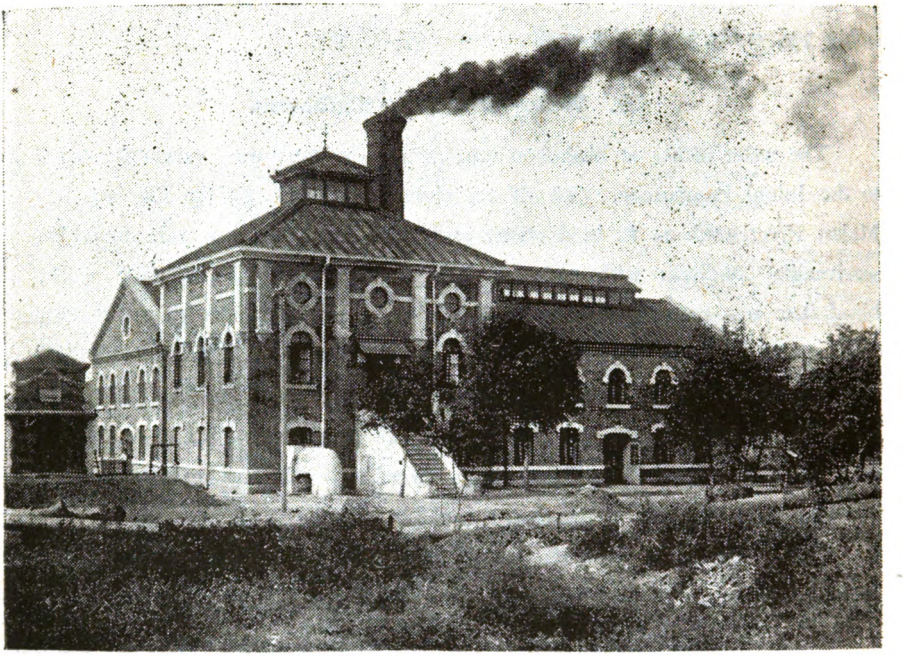
C. Lanchiatun Water Source.

This water source was created hurriedly during the winter from 1916 to 1917 under the circumstance as related at length under Chapter II.



VIEW OF INTAKE AND FORCING MAIN PUMPING STATION AT SHAHOKOU.

It is situated at Lanchiatun in the village of Hsiaopingtao at 7½ miles west of the city of Dairen. It has a drainge area of 5.4 square miles. The estimated water supply capacity of this water source is about 600 tons, but its extension at some future date is in contemplation, so as to make it auxiliary to the Malan River water source.

At this source, three wells lined with stone were excavated to gather the underground flow of the drainage area. Two of the three wells are connected each with a mortar pipe, 1 ft. in diameter, with the third well.

Again, in the dale of Lichiatun, about 1,720 yards above, a minor dam was constructed, and in the middle of this dam, an intake well, of 4 ft. in diameter,

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was sunk to gather both surface and underground flows, the water so gathered being conducted into the third well by means of 10 inch iron pipes.

A pumping house was built at the eastern side of the third well, and by a Washington pump and also a centrifugal pump, the water passes through 10 inch forcing main pipes, 8,000 yards in length, into a concrete tank installed at the highest point of the line, and then it is sent down by gravitation to the settling reservoir at Shahokou.

The appurtenances comprise the following :—

1) Dam : 63 ft. long ; maximum height 23½ ft. wide, 6 ft. on top and 50 ft. at bottom ; made of clay puddle, the upper part having a stone facing.
2) Collecting wells :
   First well ; 31.1 ft. deep, 30 ft. in diameter, lined with stone wall and covered with a lid.
   Second well ; 14.3 ft. deep, 30 ft. in diameter lined with stone wall and covered with a lid
   Third well ; 38.4 ft. deep, 30 ft. in diameter, lined with stone wall and covered with a lid.
3) Pumping Station : Wooden flat building with basement built of stone.
   Machinery installed :
   In Lower floor of Basement : 1 Washington pump (of 35 horsepower).
   In Upper floor of Basement : 16 inch centrifugal pump equipped with semidiesel engine (of 25 horsepower)
   In surface chamber : 15 inch turbine pump (of Inokuchi system)
   Total head, 165 ft. Capacity, 50 cubic feet per minute.
   2 Vertical steam engines (of 40 horsepower).
4) Tank :
   30 ft. square in inside measure, 12 ft. in depth, made of concrete, covered with a lid, and having a capacity for 300 tons of water.

D). Equipments at Shahokou Filter Plant.

1) Filtering installation : There are two kinds of filtering installations. One is the slow sand filter plant ; the other is the rapid filter plant.

As the water is likely to get frozen in winter, the slow sand filter beds are built in the ground, and the cover is made in reinforced concrete, and on the top is laid a layer of earth at least 2 ft. deep. There are two filter beds, each 180 ft. long and 90 ft. wide.

The filtering speed of each bed is 8 ft. a day, and the total filtering capacity is about 7,000 tons a day.

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2) Rapid Filter Plant. By the slow sand filters above mentioned, the water is made to pass through a layer of gravels and sand, from three to four feet thick, at a slow speed ranging from 8 ft. to 10 ft. a day.

The rapid filtration is called also the mechanical filtration. It uses chemicals to accelerate the filtering process, indeed so much as to quicken the speed by fortyfold or even fiftyfold. While gravels and sand are also used for the filtering medium, because of the speed being so incomparatively quick, this layer will soon get choked with the mud, dirt, or other impurities, which will accumulate on the top of the filtering layer much quicker than in the case of the ordinary filtering process, and which require more frequent washing. On this account, by employing mechanical applicances, the filtering layer can be washed and cleaned in only about ten minutes' time. This is how this process has come to be styled the "mechanical filtration process."

As regards the advantages and drawbacks of the two processes, they have to be studied in comparison, taking into reckoning the quality of water, construction cost, maintenance expenses, climate, and other local peculiarities. Each has its own merits and demerits.

However, it is true that the quick process is best adapted to the purification of the turbid water, particularly containing fine particles of clay which can hardly be handled adequately by the ordinary process.

To cite practical instances, occasions have by no means been few, on which slightly muddy water was served to the citizens of Dairen when in summer the raw water is easily liable to get muddied from rain or freshet, and nothing but the slow sand filtration process was used.

Moreover, in a district like Dairen where winter is excessively cold and for this reason, the filter bed must be provided with a cover to prevent the water from getting frozen, the cost of construction is naturally heavier, and further there is the extra cleaning operation of the gravel and sand layer.

Over and above, the water of the Wangchiatien Reservoir muddied by rain or freshet cannot be expected to get clear in a short space of time.

Last, but not least, in case of some infectious disease breaking out about the water sources, special care will have to be exercised over the clean water, and some sterilizing appliances may have to be installed.

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All these points being fully considered, the rapid filtration process has been adopted for the Second Extension Programme.

The sand filtering process was originated by Mr. James Simpson, of the Chelsy Waterworks of London, who experimented upon it with the simple object of removing the floating matter in the water. Subsequently, it was discovered that this method was very effective in removing also the bacteria in the water, and further that this action was not caused by the gravel or sand itself, but by the film of bacteria accumulating on the surface of the filtering medium. And this same method has come to be adopted by the cities of the world for their waterworks.

In later years, at a paper mill in the United States, a rapid filter was invented for the purpose of removing the floating matter in the water. At first, no settling chemicals were used and the results were far from satisfactory. Then, the application of settling chemicals was conceived and effected, and this shed the first ray of hope for the rapid filtration process of the present day.

The specialist, who conducted both experimental and scientific study of this method and demonstrated the feasibility of applying it to practice in the installation of filtering plants for cities, was Mr. Weston, who carried on a series of experiments between 1893 and 1894.

Since, this method has popularized itself in Europe, particularly Great Britain, not to speak of America. At first, there was some objection to this method, but at present the problem of the slow and quick filtration processes is no longer one of theory, but of circumstance.

In the rapid filtration equipment, there are two kinds of the gravitation system and the pressure system. Among what are in vogue in the West, there are Bell, Mather Platt, Candy, Pulsometre, Paterson, Drifting Sand, and Jewel filters, in addition to a few more American ones.

In planning the Second Extension Programme, the advantages and drawbacks of all the systems known were studied. Moreover, I was sent abroad, to investigate the latest developments in lines of the water service. I came to the conclusion that each system has its own merits and demerits as well, and the superiority of one of them over the others is by no means of an absolute nature, but depends on the circumstances.

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However, for the following reasons chiefly, it was decided to adopt the type of the Pittsburg Filter Manufacturing Co., of the United States:—

1) The local conditions of the site of the filtration plant, the necessary construction cost, and its bearings on the future extension were considered, and the method of the Pittsburg firm was chosen as the best. Moreover, the facility afforded in the supply and shipment of the various machinery, etc., during the World war argued strongly in favour of the American manufactures.

2) Both the Bell and the Candy systems belong to the pressure type absolutely and are not considered as facilitating to the future extension.

3) Although the Mather Platt filters are made of both gravity and pressure types and quite efficient in point of the purification of water, they require a large number of filter cells and are somewhat complicated in manipulation.

Speaking of the filtering installations of cities in general, and of a district like Dairen which is bound to face the further extension of the waterworks in particular, the desirability of gravity type can hardly be questioned.

Then, among the gravity type filters, there remain only the Paterson and the American systems outside the Mather Platt system. The first two mentioned are materially identical in general principles, and are held as nearly equally superior. Only the Paterson system leaves something to be desired in connection with the point of utilizing the then existing settling reservoir as the coagulating basin.

4) It would be an extremely tedious task to compare exactly the construction costs of the different systems. Among the pressure systems, Mather Platt filters are the most costly and the Bell filters the cheapest. Next among the gravity systems, the Paterson filters are more expensive than the American system, which is also less expensive than the Mather Platt filters.

5) There is no fixed opinion among the specialists of the world as to the purification efficiency of several kinds of filters studied comparatively. Advocates of each system speaks and writes partially for their own favourite system. Those of the pressure system found fault with the gravity system in lack of thoroughness of the cleaning of the filtering materials. On the other hand, the gravitationists held up the inconveniences of the pressure system in its handling, supervision, and inspection. They stressed upon its unsuitedness for a growing city like Dairen.

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After all has been said, the results of my painstaking study were carefully weighed, and the nature of the water being taken into account, I arrived at the conclusion that by the adoption of the gravity system, all that could be desired would be secured, and thus the final decision was made.

As already stated, all equipments, apparata, and appurtenances of the rapid filtration plant of the Dairen Waterworks were furnished by the Pittsburg Filter Manufacturing Co., of the United States, and assembled by ourselves. They were imported through the Toyo Shokai, No. 1, 1-chome Yurakucho, Kojimachi-ku, Tokyo. Its general view is as shown in the picture inserted.

The main building is of two storied reinforced concrete construction with brick outside walls, having the area of 102.5 *tsubo* in plan. The auxiliary building is 31.7 *tsubo* in area and of the same construction as the main.

The upper floor of the main building is used for the chemical solution tanks and a lime receiving hopper, and also for the storeroom of chemicals.

There are provided two solution tanks of sulphate of alumina, the coagulating agent, (made in reinforced concrete, 8 ft. square and 7½ ft. deep each), together with two more tanks for the solution of bleaching powder or hypochloride of lime which is a sterilizer, 4½ ft. by 3⅙ ft. and 7 ½ft. deep each, and a hopper of the lime-dry feed machine. Both the settling chemicals and sterilizer are conveyed up by means of a lift installed.

The filter tanks are arranged in a flat building directly opposite the entrance to the main building. Filter tanks are four in number and are installed in two rows, each row consisting of two placed on both sides of the central platform. Each is 18 ft. by 20 ft. and 5¼ ft. deep. At the bottom, each tank has two iron pipes, of oval shape, each 1 ft. in interior diameter and 6 inches high. This pipe connects at the bottom with an 8 inch pipe, which goes down through the tank, and from the bottom of the pipe gallery discharges the filtered water into the clean water tank laid out underneath the pipe gallery.

This pipe serves to carry the water purified through the filter beds to the clean water tank or to the drain pipe as the case may require.

The two pipes of oval shape are connected with wrought-iron pipe, 2 inches in diameter, covering the entire bottom of each tank at an interval of 6 inches at a right angle with them. In both the oval pipes and wrought-iron pipe, there

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are at an interval of 6 inches brass strainers, flat and circular in shape, 1¾ inches in diameter and ½ inch thick, having 34 small holes, of 1/16 inch in diameter each. Eight of these small holes are on the upper side and the rest in the side. There are altogether 1,440 strainers for each filter tank; i. e, 135 holes per square foot of the filter bed. The total area of the small holes is 150,209 square inches, being about 1/360 of the area of the filtering medium.

Up to the 2 inch wrought-iron pipe (commonly known as the laterals) the space is filled with concrete, and at about 7 inches over the laterals, there are three galvanized wrought-iron pipes, of 6 inches, 4 inches, and 3 inches, in dia., of which the first two run along the side and the third through the centre of the tank. The end of these pipes discharges into the drain pipe of 2 ft. in diameter on the floor of the pipe gallery for emptying the water in the pipes as occasion may demand.

Connecting with the 6 inch and 3 inch pipes and at a right angle with the 2 inch laterals of wrought-iron, run brass pipes, of ⅜ inch in interior diameter, at an interval of 6 inches. Each of these brass pipes has in its lower side small holes, of 16/1 inch dia. arranged in 6 inch spacing and in zigzag line, numbering 1,352, with the total area of 4,148 square inches in each filter.

The 6 inch wrought iron pipe, above mentioned, connects with a 6 inch spiral steel pipe running through the upper part of the pipe gallery, which spiral pipe, in its turn, connects with the air blower and is for forcing the compressed air to the filter bed when it is to be washed.

The filtering layer starts at the upper part of the 3 inch lateral, buried in the concrete above mentioned and consists of 4 layers of gravels and sand of various gradings as below. The first layer is of small gravels of 1 inch to 1½ inch in dia. and 6 inches thick, the second of gravels of ⅜ to 1 inch in dia and 3 inches thick; and the third of those ⅛ to ⅜ inch in dia and 12 inches thick. The fourth or sand layer is 30 inches thick and the grain of sands is not smaller than 0.35 millimetres and not larger than 0.5 millimetres, having the uniformity coefficient of 1.65.

Thus the total thickness of the filtering layers is 42 inches. The strainers project into the lowest or first gravel layer. The ⅜ inch brass air pipe is in the second gravel layer.

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The effluent that has passed the coagulation basin goes into the pipe gallery in the filter chamber through a 30 inch reinforced concrete pipe and a 24 inch cast iron pipe. At the entrance to the pipe gallery, it branches off to the right and to the left and flows into the waterways running along both sides of the lower part of the platform, and thence into the filter tanks through the pressure water valves. Then it passes through the filtering medium and gets purified. Next, it goes through the strainers and is gathered into the clean water chamber, underneath the pipe gallery. This chamber has one drawing pipe, which outside the filter chamber is furnished with a Venturi pipe, and through this pipe, the clean water runs into the clean water reservoir constructed for the purpose.

The pipe gallery is situated underneath the platform of the filter chamber. In the upper part runs the 6 inch air spiral pipe in the centre, and in the lower part run a 2 ft. draining earthen pipe and the 10 inch cast iron pipe coming out of the filter tanks and joining the underground clean water chamber, together with the valves belonging to the different pipes. Then, there are installed the appliances for regulating the filtering speed, and the pressure water pipes employed for manipulating the valves, for regulating the filtering speed, and for mixing chemicals, etc. The gallery is so arranged that one may have free access to any part thereof for the purpose of inspection.

With the rapid filtering appliances, the filtering layers easily get clogged chiefly because of the aluminium hydrate, which is a gelatinous flocky matter generated by chemical action of the chemicals used, and the fact that a much larger quantity of water is filtered than in the case of the slow sand filtration helps to reduce the filtering capacity quicker. Therefore, a cleaning operation must be repeated at stated intervals.

In the case under issue, compressed air and clean water are used for the washing purposes, and to this end, part of the cellar is set aside for the installation of the necessary machineries consisting of two air blowers of 25 horsepower each and two centrifugal pumps of 40 horsepower each.

The air pressure is 5 lbs. per square inch. The air is sent through the above mentioned 6 inch spiral pipe via the 6 inch, 4 inch, and 3 inch pipes, to spurt forth through a small exit. This will stir up the sand layer from the bottom.

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This operation is continued for 3 or 4 minutes. Then, clean water is sent by means of the centrifugal pumps.

The 10 inch pipe starting at the bottom of each filter tank, as above mentioned, branches off into three pipes. One of them goes to the under-ground clean water chamber; a second serves as the draining pipe and connects with the 2 ft. earthen draining pipe; the third connects with the 12 inch pipe, which is the main water transmitter for the centrifugal pumps.

Therefore, the operation of this pump will cause the water to pass through the pipe and to go up into the filter tank through the strainers in jets to wash the sand layer, and the overflow will get into the draining pipes by the iron troughs fitted in double through the upper part of the filter tank.

For washing purposes, the filtered water in the underground clear water chamber is drawn upon. As this operation is kept up for five or six minutes, the water which overflows becomes gradually clear, and at a suitable moment, the operation is closed.

The platform of the filtering chamber is covered with white glazed tiles, and each filter tank is provided with an operating table with marble facing and a controller column, and moreover there is a master controller for all filters.

In this installation, all valves are hydraulic and are worked by the use of the pressure water in the water forcing main from Shahokou to the Fushimidai Service Reservoirs, and these hydraulic valves are operated by the handle fitted to the operating table.

The regulation of the filtering speed is related to the special arrangements utilizing hydraulic principles with diaphram, fitted in the 10 inch pipe coming from the filter tank and is to filter 1000 times the quantity of water which is sent into the 10 inch pipe from the pressure water pipe. A water metre which measures the volume of water sent into the 10 inch pipe and sample glass tubes are provided on the operating table for testing the clear water that passes through the filter. It is very simple to manipulate.

Next, the filter controller is made of iron and is furnished with a glass tube showing the height of the water on one side and a scale indicating the opening of the main valve connected with the controller, which is one of the special, regulating

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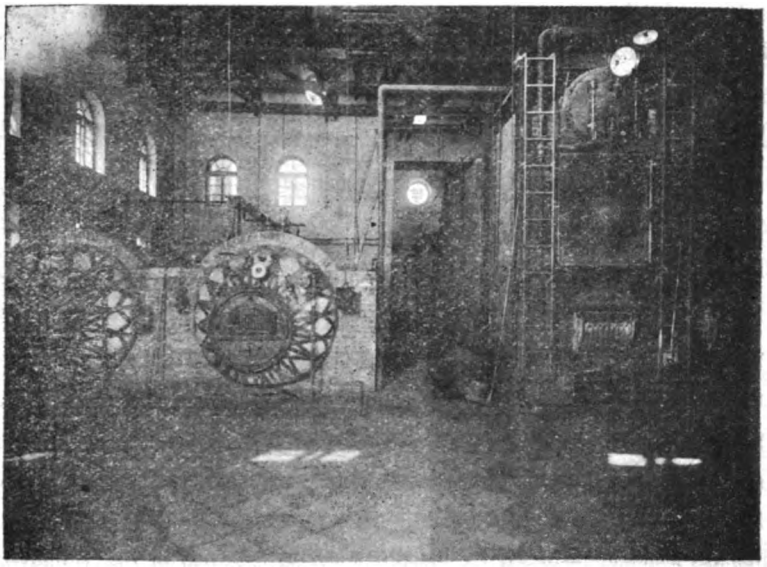
appliances in the pipe gallery. These are for regulating the quantity of the filtered water in conjunction with the water metre fitted on the operating table.



INTERIOR OF THE BOILER ROOM OF THE PUMPING PLANT.

By the scale showing the extent of the opening of the main valve, we may know if the washing is necessary. If we keep the water meter on the operating table constant to record the quantity of water passing and keep the level in the water tube also constant, we may regulate the filter to pass a certain constant quantity of water, but as the time elapses, the filtering layer becomes gradually clogged, tending to reduce naturally the quantity of the filtered water; then the main valve opens itself gradually and automatically, and at last it becomes fully opened. Thus, this serves as the loss of head gauge, by which we judge if a washing is necessary.

The room for the preparation of a solution of sulphate alumina, which serves as a coagulant, and also of a solution of hypochloride of lime, which is a sterilizer, and also for charging the pulverized lime, is on the upper floor of the main building, and four reinforced concrete tanks are provided for the above chemical solutions, together with a hopper forming the top of the lime dry feed machine.

Each tank has in the centre a vertical axle equipped with a screw at the bottom and a tiny water wheel on the top. This water wheel is automatically

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revolved constantly by the action of the pressure water, so keeping the screw in motion to stir up the mixture of the chemicals and water, and to ensure a perfect mixing of the two.

The solutions thus mixed prefectly are sent to the solution adding room on the lower floor, the solution of sulphate of alumina by a copper pipe and the hypochloride of lime by a galvanized iron pipe, and are received into U shaped receptacles, which, in connection with the water levels—in two vertical pipes, 10-inch dia., recording the water pressures in the throat, and the normal part of the Venturi pipe arranged in the clean water drawing pipe—through the mechanism called the differential gear, discharge automatically quantities of the chemical solutions exactly proportional to the quantity of the water passing through the Venturi pipe.

Again, pulverized lime goes into a special machine called the lime dry feed machine installed at a corner of the same room.

By means of a water-wheel utilizing the pressure water and also the operation of diaphrams which are actuated by the difference of pressures in the Venturi tube, the speed of revolution of the machine is automatically regulated so as to be in exact proportion to the quantity of water running through the Venturi pipe.

This same machine, besides regulating automatically the speed of revolution, is provided with the appliances of adjusting the quantity of pulverized lime entering, as well as, the speed of revolution, so that once the adjustment is made, it will only variate automatically in proportion to the variation in the quantity of water running through the pipe.

Next, the solution of sulphate of alumina and that of lime are led into the chemical mixing chamber (as mentioned hereafter) and are added to the raw water.

As to the solution of the hypochloride of lime, it is poured into the underground clear water chamber for the purpose of further sterilizing the clear water that has been filtered through.

Again, in the centre of this chamber, there is a Venturi water meter in order to indicate the rate of water which is running through and also the total quantity of water that has passed through the filters.

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The flat building adjoining the main filter building is divided into three rooms to carry on chemical and bacteriological experiments.

In the case of rapid filtration, the quantity of chemicals and the manner, in which it is manipulated, directly affect the quality of water, and it is necessary to hold examinations from time to time over both raw water and clean water; so that two officials for conducting chemical and bacteriological tests are detailed for their duties.

The filtering capacity of the rapid filter plant under notice is, as already stated, 15,000 tons per day. There is little questioning the up to-date and perfect appointments of the same installation.

In the Far East, this is the first instance, in which a filtering installation has been organized in an orthodox style.

The orders for the installations were contracted for in November, 1916. During 1917, a steamer, which happened to carry the machinery, got stranded at sea and parts of the machinery got either destroyed or damaged. It took a considerable lenght of time to obtain their substitutes. By January, 1918, all the machinery as ordered was received. The construction and installation work was taken in hand in April, 1918. All the appliances were fitted and the building work was finished by August, 1919. Still the remaining portion of work, for instance, the supply of electric power was delayed, and it was only in October, 1920, that a trial operation of the installation was executed.

Since, the new installation has been in constant use with highly satisfactory results, contributing a good deal to the improvement of the quality of water.

C) Aeration and Settling Appliances.

By aeration appliances is meant to bring water into contact with air, either in fine streams or in drops, as in the case of a fountain, in order to increase the mixture of oxygen and to oxidize the organic matter and other chemical constituents to the end of developing the quality of water. The aeration appliances are possessed, without a doubt, of a sterilizing virtue.

Again, the effectiveness of the aeration appliances as a means to remove the iron contained in the water is widely recognized, and it is this advantage of this system that commends this system to such localities as have water containing iron.

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The degree of oxidization of the organic matter, the rate of increase of oxygen contained in the water, the extent of the sterilizing action, etc., which might be caused by aeration, have not yet been reported in detail. However, their contribution to the improvement of the quality of water is beyond question.

In the Ashokan Reservoir of the New York Waterworks, the raw water is aerated on an extensive scale, to be disinfected with liquid chlorine and is supplied to the public without the cost and trouble of filtration.

At Buffalo, too, this method is employed prior to filtration.

Especially, at such places as are endowed by nature with a suitable head necessary for aeration and use a reservoir for the water source, the quality of water may be easily bettered without laying out considerable expense.

For the above reason, in the present Waterworks, the natural head has been turned to good account, and, before the water of the Wangchiatien Reservoir enters the settling reservoir by means of the 20 inch conducting pipe, it is to go through the aeration process.

By this equipment, the raw water is brought into contact with the air either in sprays or in a thin layer. This process is repeated at nine places on varying scales. The one that is conducted on the largest scale is as follows:—

Two iron pipes, each 20 inches in interior diameter and 39.5 ft. in height, stand erect in the well of elliptical shape, 42 ft. in major diameter and 12 ft. in minor diameter, built at the entrance to the settling reservoir, with a depth of 24 ft. 17½ ft. of these two pipes stand out of the water level, and three circular-shaped thin flat blocks, made in reinforced concrete and ranging in diameter from 4 ft. to 6 ft., are fitted to the pipes at an interval of five feet. The uppermost block has holes, each ⅛ inch in diameter, made at the spacing of 1 inch so as to make the water falling thereon from the mouth of the stand pipes to many fine streams. The lower block is to receive the fine streams coming down through the top block and to let the water run over the surface in a thin layer before going further down on to the lowest block which is made exactly like the uppermost one. The water then joins the well water.

Minor aerating devices are fitted to the 10 inch pipes disposed at seven different points close to the entrance to the ordinary settling reservoir. The dimensions of the circular shaped thin iron plates measure in diameter from 4½ ft. to 6 ft., and

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there are two such, the upper one made after the pattern of the uppermost block, and the lower one, of the middle block, as indicated above. The top of the pipes is 6 ft. above the water surface of the reservoir.

I have stated that there are two kinds of settling reservoirs, the ordinary and the chemical.

The ordinary or plain settling reservoir is to keep the raw water in a practically still condition and to allow the floating matter to settle.

In the case of the coagulation reservoir, a settling agency like sulphate of alumina is applied to let the suspended matter settle quickly.

For an ordinary filter bed, an ordinary settling reservoir is wanted; and for a rapid filter bed, a chemical settling reservoir is required.

The Dairen Waterworks has, as already mentioned, both kinds of filter beds.

The ground water from the Shahokou well and from the Lanchiatun wells and also even the water of the Wangchiatien Reservoir, when necessary, are dealt with by the slow filtration. The rapid filtration arrangement is chiefly for the raw water from the Wangchiatien Reservoir.

Upon this plan, the two kinds of settling reservoirs are required, and for this reason, the reservoir constructed as an ordinary one according to the first Extension Programme, 302 ft. by 222 ft., on the top, and 240 ft. by 160 ft. at the bottom, 12 ft. in the depth of water, and having the admissible capacity of 716,303 cubic feet, has been reconstructed to the extent that one-third thereof has been converted into a coagulation reservoir.

In consequence, all the raw water gathered from the various sources has to enter the elliptically-shaped collecting well provided with the aeration equipment, to pass through the plain settling reservoir, and, if necessary, to go into the slow sand filter beds at once, or to flow into the chemical settling reservoir.

The chemical settling reservoir or coagulation basin lies adjoining to the plain sedimentation basin by means of a partition wall, being further divided into two parts, one larger and the other smaller, by means of two partition walls at the right angle to the partition wall above mentioned. The two partition walls, are 7½ ft. apart and have a brick building on the top. In the space of the 7½ ft. between the two partitions, there are arranged many baffle wooden plates at the interval of 1½ ft. These baffle plates are so arranged that the first ends 1½ ft.

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above the bottom, whilst the second starts from the bottom, but ends four ft. lower than the first, that the third is like the first, the fourth like the second, and the fifth like the first. The water passing through these partitions must go up and down alternately, thereby facilitating the complete mixing of the chemicals. On this account, this chamber is called the Chemical Mixing Chamber.

Thus, the raw water which has passed through the plain sedimentation reservoir will go down the open channel specially constructed for the purpose inside the Chemical Mixing Chamber and will get into the corner of the Chamber nearest the rapid filter plant to receive sulphate of alumina and lime-water from the automatic chemical feeding devices, then going backward into the Chemical Mixing Chamber, will get well mixed by flowing up and down through the bottom and over the top of the baffle plates. Next, the water will get into a corner of the Chemical Mixing Chamber adjoining the plain sedimentation reservoir, to branch off into the two coagulation reservoirs on the right and on the left through the small holes made in the bottom.

The chemical settling reservoir being larger in area than the chemical mixing chamber, the water will flow more slowly, precipitating the suspended matter as an effect of the action of the chemicals previously applied. The water will thus become much clearer as it flows on, and will get again near the rapid filter plant of the chemical mixing chamber. Then, it will enter the rapid filter beds through the 30 inch reinforced concrete pipe and the 24 cast inch iron pipe.

The coagulation basins are of the capacity of 6 hours at the rate of 15,000 tons per day.

D) Clean Water Reservoir.

The clean water reservoir is chiefly to gather the clean water from both the rapid and slow sand filter beds, and to make up for the difference between the quantity of water sent by the transmitting pumps and the quantity of water supplied by the filter beds.

It is constructed under ground, 60 ft. square and with a depth of water of 8⅓ ft. It is divided into two compartments by a partition in the middle. In each compartment, the water route is constructed, so that it may flow through between two walls running crosswise, and when it reaches the edge of the chamber, it turns

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a little the other way and then takes a parallel line to the first, and so on. In this manner, the water keeps running in an almost zigzag manner.

E) Pumping Station.

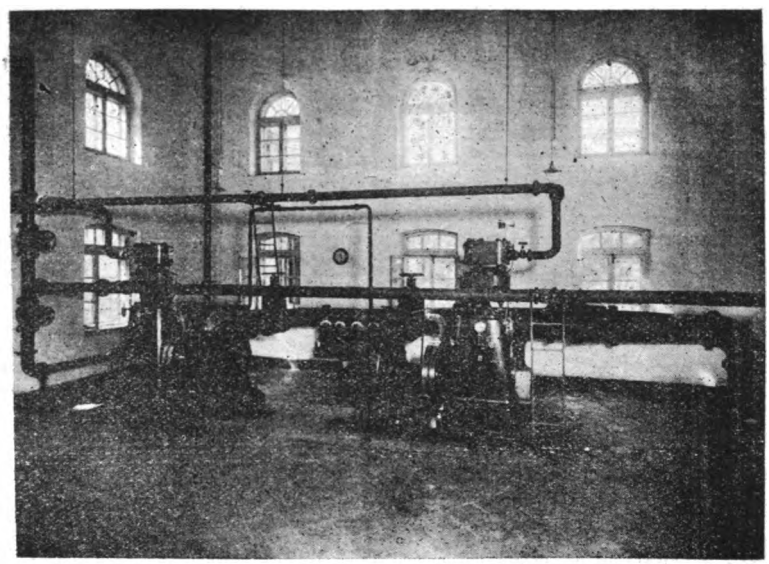
The pumping station is equipped with two kinds of pumps classified by their different purposes—one is the intake pumps and the other the forcing pumps.

1) Intake pumps:

The underground flow is gathered by the Shahokou wells (inclusive of the blind dam), and it is then pumped up to the settling reservoir by means of the intake pumps which are as follows:—

Two centrifugal pumps, each 10 inch in suction diameter (head, 45 ft: Capacity, 1800 English gallons per minute).

Two Cornish steam engines.



INTAKE CENTRIFUGAL PUMPS IN THE PUMPING PLANT.

2) Forcing pumps:

By means of the forcing pumps, the filtered water in the clean water reservoir is sent to the Service Reservoir, Fushimidai.

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Two triple expansion vertical plunger pumps (head, 250 ft: capacity, 1,800 English gallons per minute).

Two water tube boilers (Babcock & Wilcox).

One three stage electric driven turbine pump (head, 320 ft.; capacity, 2500 English gallons per minute; actual horse-power, 350).

Of the above mentioned three, the two first mentioned were installed on the First Extension Programme, and the third was installed according to the Second Extension Programme. The trial operations of the turbine pump was completed at the end of March, 1921.

Out of the three transmitting pumps, two are in constant use, the other being held as the spare one.

Their maximum daily transmitting capacity is 25,000 tons, which is more than sufficient for the existing capacity of the water sources.

Water Transmitting Pipes.

There are two water transmitting pipe lines, each 16 inches in diameter, running the whole length of 4200 yards from the pumping station at Shahokou, to the service reservoir, Fushimidai.

Service Reservoirs.

There are three service reservoirs at Fushimidai, two of which are for distribution of water to the lower levels at Dairen, and the third to the higher levels.

Service Reservoirs for Lower Levels.

They are located at 190 ft. above the mean tide. One is of circular shape, and was installed under Russian regime, capable of holding 80,000 cubic feet of water. The other is of square shape, with a capacity for 144,000 cubic feet.

They are both underground and constructed in reinforced concrete. The total capacity is 224,000 cubic feet, which represents half day's supply capacity of the Dairen Waterworks.

Service Reservoir for Higher Levels.

With the rapid growth of the city of Dairen in recent years, the strips of land at the foot of Nanzan Hill running from east to west in the south of the city have

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been converted into residential lots. Even, prior to this, the higher levels of the city have been shown to have too small a water head, giving only an unsatisfactory supply.

Therefore, for the Second Extension Programme, a Service Reservoir for the higher levels was constructed at the height of 290 ft. above the mean tide. Water may be sent up to this Reservoir from the other Reservoirs for the lower levels by means of two 8 inch turbine pumps, each capable of transmitting 108 cubic feet per minute and lifting the water by 130 ft., and having 40 actual horsepower. The water thus obtained is distributed by a 10 inch service pipe to the higher levels at the base of Nanzan Hill and Osakamachi.

This Reservoir is 60 ft. square with a depth of water of 12.6 ft. and a capacity for 1,200 tons.

Service Pipes.

The Service pipes range in diameter from 4 inches to 18 inches. The supply district includes Jijiko (East End), Tanchiatun (south of Hsiaokangtzu, Chinese Quarter), Shahokou, and Hoshigaura, in addition to the city of Dairen.

Construction Expenses.

Since the Dairen Waterworks passed into Japanese management, up to March 31st, 1921, the aggregate cost invested amounted to about ¥4,784,000 comprising the following:—

For 1st extension programme	¥994,000
» 2nd » »	1,819,000
Construction of impounding reservoir	inclusive of ¥477,501
Laying of conducting pipes	335,808
Rapid filtering installation	161,179
Reconstruction of Settling Reservoir	84,526
Construction of Clean Water reservoir	25,776
Purchase of water transmitting pump, removal of pumps already installed, & extension of pumping station	112,017
Installation for supply to higher levels	190,505
Laying of additional service pipes	257,569
Connections installed in Purification plant	72,133
Purchase of machinery & tools, house building, & office furnishing	101,985
Lanchiatun Waterworks Installation	180,000
Laying of additional water mains	271,590
Laying of additional service pipes in City	519,410
Total	3,784,000

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Against the inhabitants consisting of the Japanese and foreigners, numbering 61,238, and the Chinese numbering 125,407, as the census at the end of 1920 showed, the expenses laid out by the Kwantung Government are rated at ¥42.47 per capita. This rate is obtained upon the calculation that, the daily consumption of a Chinese being 1 cubic foot and that of a Japanese 4.5 cubic feet, 125,407 Chinese are equivalent to 27,868 Japanese in the daily consumption amount.

Quality of Water.

The water of the Dairen Waterworks is highly excellent and compares favourably with the other cities in the world. Especially since the completion of the Storage Reservoir and the filtering installation, the water has been noted to be markedly enhanced and unified in quality, which fact deserves congratulation from the viewpoint of public hygiene.

The following is a table indicative of the quality of the water taken from the plain settling reservoir, the rapid and slow sand filter beds, and the service reservoir, on March 29, 1921 :—

	Plain sedimentation reservoir	Water passing through rapid filter beds	Water passing through slow filter beds	Service reservoir
Atmospheric temperature ...	12° C.	12° C.	12° C.	7° C.
Temperature of water	5° C.	6° C.	6° C.	7° C.
Turbidity	Slightly muddy	Clear	Clear	Clear
Colour	Slightly ashy-grey	Colourless	Colourless	Colourless
Odour	None	None	None	None
Reaction	Slightly alkaline	Slightly alkaline	Slightly alkaline	Slightly alkaline
Chlor	26,625	24,850	42,600	35,500
Sulphuric acid	Trace	Trace	Trace	Trace
Nitric acid	»	»	»	»
Nitrous acid	Not discernible	Not discernible	Not discernible	Not discernible
Ammonia	»	»	»	»
Decolourization by potassium per-manganate wanted for oxidization of organic matter.	6,636	4,424	1,580	2,844
Aggregate solid matter ...	116,000	112,000	140,000	128,000
Lead	Not discernible	Not discernible	Not discernible	Not discernible
Hardness	2,108	2,680	2,940	2,680
Bacteria contained in 1 cubic centimetre of water	22	2	4	6
Pathogenic bacteria	Not discernible	Not discernible	Not discernible	Not discernible
Verdict	Outwardly bad	Good	Good	Good

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Remark: The figures under the heads of atmospheric temparature of water, chlor, decolourization, and aggregate solid matter denote the number of milligrams contained in one litre of water.

Of all the items in the above table, the most obnoxious ingredients are lead, ammonia, and nitrous acid, none of which is discernible in the water of the Dairen Waterworks. The presence of any of these matters points to the unwholesome proximity of the water in direct contact or otherwise to the sewage. Any water containing less than 100 bacteria in 1 cubic centimetre is pronounced as fit. Even at the waterworks of several cities in Japan, the bacteria in the water passing through the filter beds ordinarily number between 20 and 30. According to the above mentioned test table, the bacteria in the water of the sedimentation reservoir number only 22, and when the water has passed through the filter beds, the number is reduced to 2 or 4.

This is attributed chiefly to the prolonged settling process going on in the Wangchiatien Reservoir and the self-purifying action, which have worked to improve no little the quality of the water, and may in some measure, be ascribed to the efficacy of both the ordinary filter beds, and particularly the rapid filter beds.

It may be added that the time when the specimens of the water were taken for the above test happened to be after the winter when the water of both the Reservoir and of the underground flow is at its best.

Even in the rainy season, in which the raw water is liable to be muddy, now that both the settling and filtering equipments are quite complete, the quality of the clear water of the Dairen Waterworks is believed to be quite pure.

As regards the efficiency of the rapid filter bed, it has been only lately constructed, and it is rather premature for me to try to publish anything approximately accurate. However, I am under the belief that, as to the number of bacteria in the water, it can be kept below 10 per cubic centimetre, irrespective of seasons.

Then, concerning the sterilizing appliances, under installation, there exists hardly any use for such, seeing that the raw water is so pure that it gives no occasion for fearing the presence of disease germs. They will, however, stand the Waterworks in good stead, when necessity for them arises at some future date.

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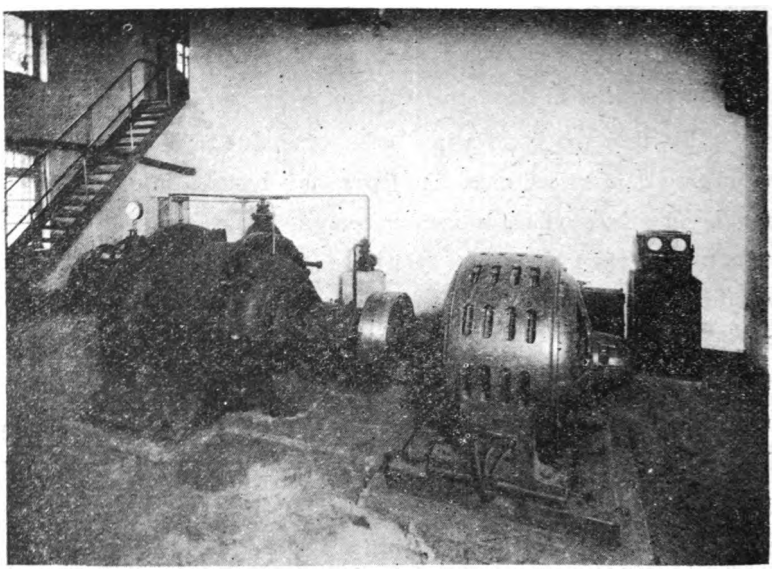
In short, the water of the Dairen Waterworks is not only excellently suited to drinking, but also in point of hardness, it has been found no higher than 2° or 3½° as the result of the German test applied thereto. It may well be called soft water and may be regarded as quite suited to industrial uses.



350 HP ELECTRIC DRIVEN TURBINE PUMP FOR FORCING WATER TO THE SERVICE RESERVOIR AT FUSHIMIDAI.

Chapter IV. Third Extension Programme.

The work on the Second Extension Programme was finished on March 31st, 1921, thereby quite completing the Programme.

However, the steady growth of the city of Dairen demanding an adequate provision for no distant future, as mentioned in Chapter II, the Third Extension Programme was submitted to the extraordinary session of the Imperial Diet in 1920, and work was taken in hand in August of the same year, a brief outline of which is given under:—

The site for the new water source has been fixed upon Lungwangtang under jurisdiction of the Ryojun (Port Arthur) Civil Administration at about 18 miles west of Dairen. The Malan River valley has already been availed of to its utmost,

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leaving no further room for extension on a large scale. The need of some suitable spot being pressing, the Lungwangtang valley adjacent to the Malan River valley has been selected after a careful inspection of the district. The river consists of three branches, the longest running for almost 9 miles. In geological structure, the Lungwangtang valley bears a close resemblance to the other. The river has little water running in ordinary times, but at a heavy rain, there will be a freshet just as in the other case. By constructing a reservoir at Kuanfangtzu at about 2½ miles from the mouth of the river, where it gets the narrowest, a large catchment area and a great storage of water may be made available. On this account, an extensive reservoir is to be constructed at this point, to dam up the river water during the rainy season. A pumping station will be built below the dam, and the water is to be sent to Dairen over the hills intervening.

The new dam is to be made of rubble concrete, being 121 ft. high and about 1,048 ft. in total length, of which 352 ft. is for the overflow and 180 ft. is for the earth dam. The new dam is to be 14 ft. in width on top and 92 ft. at bottom, with its body containing about 13,300 cubic *tsubo* of masonry. The catchment area for the new dam comprises about 15 square miles; the new reservoir to be so formed is to have the water area of 480,000 *tsubo*, 75 ft. in maximum depth of water, and the effective storing capacity of 16,000,000 tons. Compared with the Wangchiatien Reservoir, it will be nearly two and half times as large in the water area and three times as much in storage capacity. As regards the dam, the new one will be 25 ft. higher and over twice as large in actual volume of masonry.

For pumping power, the electric power house at Ryojun (Port Arthur) is to be enlarged, and transmitting wires are to be laid over the distance of about ten miles. Three turbine pumps, each of about 500 kilowatts, are to be installed.

The main transmitting pipes are from 24 inches to 22 inches in diameter.

At the time when the appropriation for the Third Extension Programme was asked, all materials were exceptionally high priced as a result of the great World war, and on this account, out of the consideration of economy, it was planned to lay transmission pipe lines, of 20 inches in diameter, with the length of 7,000 yards from the new pumping station to a point at 2,280 yards above the Wangchiatien Reservoir through a tunnel, 3,200 yards in length, to be

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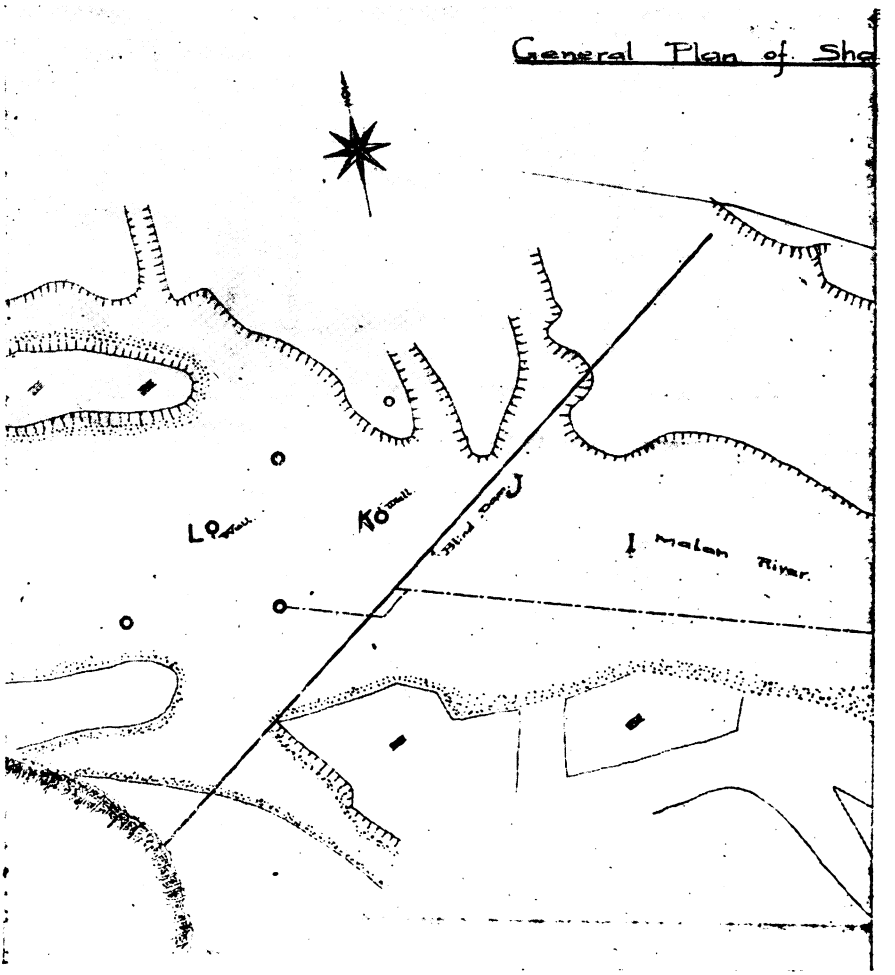
pierced through the watershed rising between the Malan River and Lungwangtang Valleys. The water was thus to be discharged into the Wangchiatien Reservoir by natural inclination, to be led by means of the existing conducting pipes into the purification plant at Shahokou.



A. Aerators.
B. Plain Sedimentation Basin.
C. Coagulation Basins.
D. Rapid Filter Plant.
E. Slow Sand Filters.

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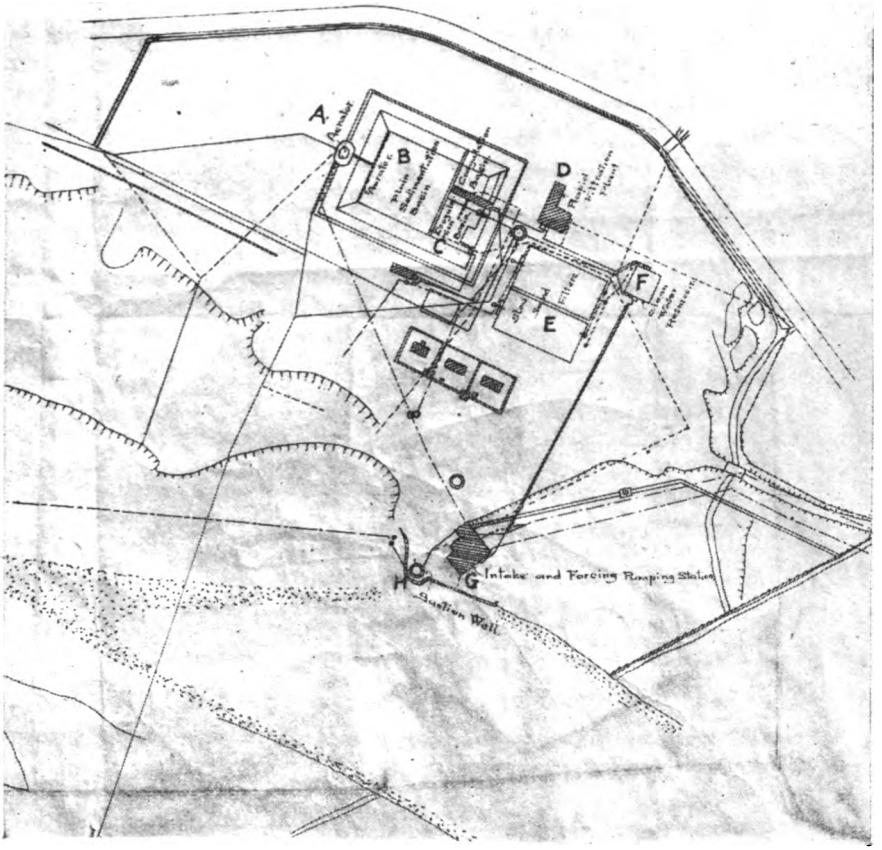
However, as the materials, labour, etc., have gone down since, and especially as the daily local consumption has sharply increased quite beyond the original expectations, the question of supplanting the above plan with another, by which the water may be conducted more advantageously from the new Lungwangtang

kakou Water Filtration Plant.



F. Clean water reservoir.
G. Intake and forcing pumping station.
H. Suction well for intake pumps.
J. Blind Dam.
K. Wells.

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Pumping Station direct to Shahokou by the shortest cut via Huangnichuan, is under consideration.

When the new Extension Programme is completed, the supply capacity of the Dairen Waterworks will consist of 22,000 tons from both Wangchiatien and Lungwangtang, 2,000 tons from the Shahokou wells, and 600 tons from Lanchia-tun, giving the total of 24,600 tons, which is about twice as much as the present capacity.

The same work was started in 1920 and is to continue to 1924, the total cost reaching ¥4,681,380 which sum is apportioned according to the years as follows :—

Fiscal year 1920	¥ 433,500
„ 1921	1,192,495
„ 1922	1,243,895
„ 1923	1,103,495
„ 1922	707,995

Annual Water Supply Returns.

	Cubic metres	Price per ton
1908	792,554	¥0.0894
1909	1,012,003	0.0953
1910	1,272,352	0.0777
1911	1,408,094	0.0798
1912	1,626,959	0.0806
1913	1,560,632	0.0858
1914	1,458,199	0.0951
1915	1,719,149	0.0774
1916	1,772,570	0.0768
1917	1,669,049	0.0908
1918	2,837,182	0.0799
1919	3,606,433	0.0855
1920	4,357,267	

Remark: The price has been obtained by dividing the total water rate collected for the year by the amount of water supplied in the same year.

Total Population and Subscribers to Waterworks.

	Total population	Subscribers to Waterworks
1906	12,301	
1907	30,826	
1908	38,120	
1909	37,904	

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	Total population	Subscribers to Waterworks
1910	40,750	23,754
1911	47,518	31,974
1912	49,825	36,922
1913	70,202	43,383
1914	68,492	48,040
1915	85,360	53,443
1916	91,725	69,443
1917	102,797	77,295
1918	120,696	94,939
1919	131,978	106,206
1920	163,365	

The total population includes the inhabitants of Dairen City proper, Hsiaokangtzu, Tanchia-tun, Shahokou, & Hoshigaura.

CURRENT NEWS.

Mr. Poultney Bigelow.

(The famous American author and lawyer)

Mr. and Mrs. Bigelow were received into audience by H.I.M the Empress on the 2nd., being the first foreign author and wife to receive the honour.

Ed. L. of M.

His Observations on his Recent Tour of Japan's Dependencies.

Mr. and Mrs. Poultney Bigelow have been making a visit through the principal dependencies of Japan in order that Mr. Bigelow might note the changes that have taken place since his first visit in 1876. "It has been his fifth," and as he says, "final voyage in these waters"; and the result of his observations may be expected in book form as chapters complementary to his "Children of the Nations," which was written when the Kaiser's flag flew over Kiaochow and Russia leaned heavily against Manchuria.

Asked regarding Shantung and Japanese occupation of Tsingtao, Mr. Bigelow said in substance:—

Japan has not nor can she hope to plant many of her people in that peninsula, for already it is as crowded as Belgium. Moreover, the Chinese of

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Shantung can underbid the Japanese as labourers and they are excellent workmen. But Japan has a free field in Shantung for economic development, and in this field, she has a right to expect American support. China, to-day, has but the caricature of a Republic and her professions of Reform are as grotesque as would be of those of Tammany Hall in favour of an organge parade in Manhattan. There is no civilization in Shantung save along the thin strip of Railway guarded by Japanese police, and he who leaves this territory finds himself suddenly plunged back into medieval chaos where travel is insecure; where villages are periodically raided by gangs; where the roads are merely trails for carts without springs; where bridges and culverts are curiosities; where no coinage exists, and where only crooked politicians are contented.

Question: "Do you notice any difference between the present Tsingtao and that of 1898?"

Answer: "The Germans did creditable work here, for the German Administration had military force and plenty of money. They laid out a modern city and sank more than 100 million dollars in harbour works and municipal plants. They made Tsingtao a favourite resort for all Europeans in search of bracing climate and they fortified it with a thoroughness equal to what they displayed at Metz after the Franco-German War of 1870. But in spite of their thoroughness in material things, they had not the gift of winning the confidence of the Chinese. If they had been good colonizers, they would have had a Chinese Army fighting for them in 1914.

In 1918 I saw German non-commissioned officers flogging Chinese coolies who were handling heavy loads from the water side and up a hill where the Kaiser was building a memorial for his conquest. Chinese are not flogged in British colonies—nor are they treated as mere animals. For that reason, England was able to recruit Chinese during the Great War, whereas throughout the German Colonial Empire the natives rarely raised a hand when the Black White and Red was lowered in the dust.

Germany built a splendid city and railway in Shantung—but Japan has done more—she has nearly doubled the population of Tsingtao since the Germans disappeared in 1914, and she has had to enlarge the port and add immensely to the public utilities. Chinese crowd in upon Japanese territory, and no better

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answer need be given to those who charge the "Mikado's" Government with cruelty to natives.

Mr. Bigelow visited also Chosen (Korea), Manchuria, and Formosa—the last one interested him the more because of its proximity to the Philippines and the many problems there calling for solution—all of them roughly analogous to those vexing Uncle Sam in Manila.

"Japan cannot *colonize* in Formosa any more than can America make a white man's country of Luzon; but already Japan has transformed an island that was a nest of pirates fifteen years ago into a land of promise for long headed investors who understand sugar, tea, camphor, lumber, tobacco and the infinity of commercial possibilities in this long neglected country. The interior still hides many head-hunting tribes, and these keep the police constabulary busy. Only last year forty of the police had their heads cut off by these active and enterprising people, who resemble much the cognate savages in our Islands. Yet one of my Formosan experiences was to address a whole school-room full of children whose parents were hideous headhunters only just commencing to see the wisdom of having their children trained in a Japanese school.

"Japan is doing a vast educational work in each of her dependencies, for no teachers are better than those who graduate from her normal schools. In the past there was excuse for missionary schools, but now it would be well, if Japan gave them all notice to quit or else to conform to the high standards of Tokyo. Of course, there is ample room for well trained English and American teachers in Japanese institutions, for ours is the favourite language of intercourse between Europeans and Japanese or Chinese. But what Japan objects to, and very wisely, is a body of aliens who inoculate the children with strange and conflicting doctrines on the subject of morals and religion and above all patriotic obligations. The missionary from Connecticut and New Jersey wants his converts to be as he is, which means to forsake the ways of one's ancestors.

"Japan, on the other hand, wants loyal subjects whose loyalty is founded on respect for parents and ancestral institutions.

"There is now a splendidly equipped railway running the whole length of the Island (Formosa) and an excellent harbour at the southern extremity from which it is only a night's run to the Philippines.

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"In Formosa, there are mountains like those of Switzerland and you can choose any climate from that of the Pine and Maple to that of the Pine Apple and Pappeia. There are three and a half million of Chinese in Formosa, and Japan is anxious lest *more cheap* labour should produce trouble. It is interesting to note that while California howls at those who can labour more cheaply than an American, Japan, in her turn, clamors for laws that may exclude the cheap labour of other countries, notably Chosen (Korea) and China."

Mr. Bigelow has been asked to deliver some lectures before the Imperial University, Tokyo, after which he is to visit the the Island of Saghalien and then embark for Seattle on July 8th, by the Nippon Yusen Kaisha line, returning directly with Mrs. Bigelow to their home at Mulden on the Hudson.

Asked regarding the political situation, Mr. Bigelow declined to enter upon that matter because he had full confidence in the President and his Cabinet advisers and was moreover convinced that neither country was desirous of starting a new war for the mere pleasure of humouring a bunch of Irish politicians on the Pacific Slope. However, Mr. Bigelow strongly emphasized the point that any newspaper editor printing a malicious item should be immediately deported, if that item was of a nature to embroil us in war with a friendly Power.

For instance, said Mr. Bigelow, "My wife and I were warned many times before leaving home last March that Americans were badly treated in Japan, that they had learned so from reports in the papers."

Now this is a cruel falsehood and harmful to our transportation companies, for no doubt many American ladies have been frightened by the vision of a hostile mob at Yokohama. But my experience has been wholly pleasant and our Military Attache, Col. Burnett tells me that his experience, which covers many years, is identical with mine, and he can be easily known for an American for he frequently wears his uniform when travelling officially."

Asked in regard to Chosen (Korea), Mr. Bigelow replied:

"Forty-five years ago, that land was a wilderness of hopelessly incapable humans. Twenty-three years ago I was nearly killed in Chemulpo by a shot from some native enthusiast. To-day one can travel from one end to the other not merely in safety, but also under the best railway and hotel conditions. Japan has opened this country to all the world; for it is only where the Japanese policemen

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paces the beat that the Korean brigand behaves himself and the peaceful farmer dares to bring his load to market. I found in Korea a remarkable activity in school matters—Koreans and Japanese learning side by side and sharing in outdoor exercises. There is much territory still to be reclaimed where brigands plunder and murder as they did under Chinese rule, but patience and firmness are winning here as in Manchuria, Shantung, and Formosa. Have the Japanese made mistakes? Of course they have, but they have been quick to correct many of them. They have abandoned their rule of soldiers for the safer one of rule by civilian policemen; and the higher officials constantly emphasize the importance of studying native custom, and proceeding slowly with reforms, however much they may appear to be needed. I have met many who point out the Japanese defects and I appreciate the honesty of these who champion the cause of Korea for the Koreans. But these very honest people have minds unequal to any mental vision beyond that of their missionary compound, or they would know that, were Japan to abandon Korea, that country would fall back into the barbarism which was hers when first I knew these waters. Only an enemy of Korea could conceive of so disastrous a suggestion.

MANCHURIA ENLIGHTENING SOCIETY.

Whose Organ the "Light of Manchuria" is.

What actuates us in our endeavours to open up Manchuria and Mongolia lies in realizing our ultimate ideal in the enlightenment and development of Manchuria and Mongolia. It will not do only to develop the natural and industrial resources, but the ethical and intellectual culture of the inhabitants must also be carefully husbanded and nourished, so that both mind and matter may be developed in harmony.

The Manchuria Enlightening Society raised its first cry in order to fill a sorely felt need. Its primary mission is to investigate and propagate the truths of the development of Manchuria and Mongolia. We shall studiously refrain from misleading the public by disseminating inaccurate or exaggerated reports, but shall steadfastly adhere to the truth or facts only.

It is urgently important that the truths regarding Manchuria and Mongolia should be made known clearly not only to Japan and China, but also to Europe and America. On this account, the establishment of the Manchuria Enlightening Society is bound to have a serious significance of international character.

If happily, through the establishment and activity of this Society, the truths of the development of Manchuria and Mongolia should become topics of world wide interest, it would not be only an honour to those now actively engaged in developing these regions, but also a matter of

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congratulation to the world at large.

We might be permitted to add that the ultimate ideal and desire of this Society are to serve as the herald of all enlightening movements in future, thereby opening a new chapter in the annals of the world's civilization.

What is the Society Like.

a) Office.—The office of the Society is in the Municipal Office Building on Central Circle in the city of Dairen.

b) Society's Work.—The works of the Society include the following :—

1. Publication of the organ of the Society, The "Light of Manchuria."

2. Supply of general information through the Socitey and by other means, giving the results of such investigations and researches as may be conducted in the interest of the development of natural, industrial, and other resources in Manchuria, Mongolia, and Eastern Siberia.

3. To act as guide to intending investors in general in all kinds of enterprises in Manchuria, etc., and also to undertake any special investigation or research on application by promoters of all kinds.

4. To offer facility to travellers on inspecting visits to Manchuria, Mongolia, Siberia, Chosen (Korea), China, etc., to the end of importing accurate information and rendering their observations as close to truth as possible.

5. To use all kinds of means in order to propagate the true conditions obtaining in Manchuria, etc., and further to carry on the propaganda work for these regions through the medium of lecture meetings, exhibitions, etc.

6. To compile, publish, sell, and distribute books, pamphlets, etc., bearing on Manchuria and Eastern Siberia.

7. To carry on other works necessary for disseminating information on Manchuria, etc., and also for fostering economic enterprises therein.

c) In carrying on the above work, the Society is divided into the following :—

Secretariate,
Research Department,
Publication Department,
Intelligence Department, and
Accounting Department.

d) Any one wishing to join the Society is requested to send in a written application, giving the name and address, accompanied with the membership fee for not less than three months paid in advance.

e) The membership fee, entitling the member to a copy of the monthly organ, costs 50 sen (½ yen) per month and ¥6 per annum.

Remittances.

All remittances to this Society may be made most conveniently and safely to Transfer Savings No. 2850, Dairen. No receipts for the same will be issued, but instead the Society's monthly organ will be sent.

Officials.

Baron S. Gôto (Mayor of Tokyo), President.

Mr. S. Nakanishi (ex-Vice-President, South Manchuria Railway Company), Chairman;

Mr. Y. Aioi (Chairman, Chamber of Commerce, Dairen), Vice-Chairman;

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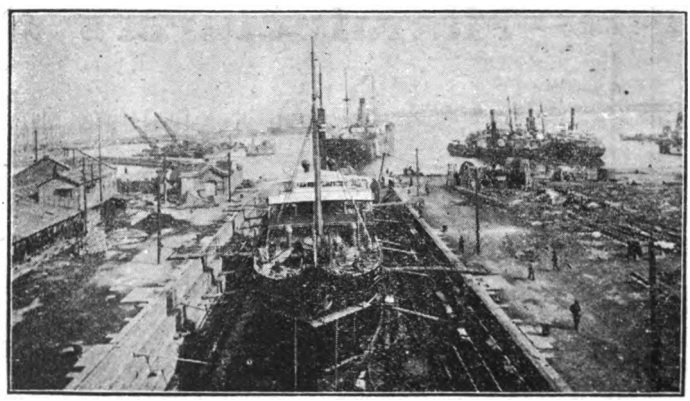

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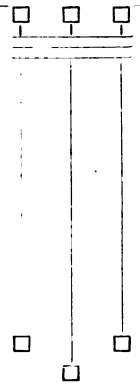

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OUTER MONGOLIA.

By Intendant-Capt. K. Yamada.

I. Topographical Features.

The topographical features between Kalgan and Kulun may be summed up as plateau. But, as one looks further, one will know that Hannorber Pass stands about 400 metres above the surface of ground and is located at about 20 miles north of Kalgan. It may well be called steep or precipitous.

North of this mountain, lines of undulation run from east to west. About Wute, it is 782 metres above sea level; about Tsuiling, it goes up to 1,505 metres, and near Kulun, it reaches 1,416 metres.

These undulations are of considerable dimensions, one of them having a width of from 6 2/3 miles to 10 miles ordinarily, and in some cases, from 16 miles to 20 miles. The sloping is gentle. Only between Miaotan and Chiapushih, and again between Kulun and Tsuiling, a few rather steep hills of only about 100 metres in altitude from the ground are met with.

As to rivers, one runs between Miaotan and Hsinghocheng, and another about 7 miles north of Tsuiling on the road from Hannorber Pass north to Kulun. Each is only about 10 metres wide and 10 centimetres deep. The two are the only rivers between Hannorber Pass and Kulun. There is another river at about 7 miles south of Tungyingtzu, Kulun. It is called the Tula River some 120 metres wide, 1 metre deep, with the speed of 7.8 centimetres per second.

Thus it may well be said that there is not a river worth the name in Outer Mongolia.

Between Tolokai and Kulun, there are three or four spots, 50 to 300 metres square, which are swampy. Such places contain an abundance of salt. Pools are met with here and there, but none of them is worth mentioning.

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(2) Roads.

There are five roads leading from Kalgan to Kulun. One of them runs along the telegraph line, and is principally used by motor cars, ordinary travellers, caravans, etc. On this account it is familiarly known as telegraph rood, trade road, or caravan road. The second one is called Government road or stage cart road. It is availed of by Chinese and foreign Government officials travelling by stage carts, by the Mongolian princes on their outward and homeward journeys to and from Peking, and also by despatch couriers from Outer Mongolia to Peking. Thus it is styled Government road.

Nowadays when motor cars have become the most popular conveyance, those who make use of this road are very few, and it has a very slack traffic, compared with former times. The third, the fourth, and the fifth roads are either a fork starting from a point on one of the two roads, or one connecting the two.

Only the fourth road is endowed with a facility in finding water supply and pasturage. On this account, it is patronized by quite a number of ox-driven carts despite its having many slopes. The remaining two roads seem doomed to eventual disuse.

Each of these roads has been formed by the travellers, and there are few traces of human improvement. However, since the soil is made up of a mixture of earth, sand, and gravels, the road-bed is quite hard. Near Wute, there are a few sandy belts of short distances. Still a 10 ton motor trucks find little difficulty in negotiating these roads, fully loaded. Needless to add, they are good for foot and horse traffics. The same thing may be said of even outside these roads. Only, for a distance of some 30 miles north of Kalgan, it is an ordinary Chinese road and offers one some difficulty to cart and horse traffic in the rainy season, etc.

However, as the road bed is in such a condition, even in or after a heavy rain, traffic is not blocked so effectively as in Manchuria. Therefore, a bog knee-deep is a thing unknown in these parts. In short, traffic is maintained with comparative ease irrespective of seasons.

(3) Stages between Kalgan and Kulun.

What the distance between Kalgan and Kulun really is is a matter of varied opinion. There is some good reason for the variation. For instance, in Outer

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Mongolia, no village is fixed. Every one is liable to be shifted. This year, one of them may be located here; next year it may be removed elsewhere. So, the records of distances by different travellers may be approximately correct for the time they travelled at, but may not be utterly dependable thereafter.

Judging the distance between Kalgan and Kulun on a map on a large scale, it might appear some 750 miles in a bee line. But, even the telegraph lines, which are usually laid in a straight line, where possible, are often found following a curved line. Even the telegraph road above mentioned is widely separated from the actual telegraph line. Near Erhlien, one is fifty miles away from the other.

The distance between the two places may be computed on the bases of data available.

a) There are altogether 20,805 telegraph poles between Kalgan and Kulun. As the distance from pole to pole is 103 paces on an average, the following result is obtained:—

poles paces c.m. c.m.
$(20805-1)\times 108\times 75=1,607,109=$about 1,002 miles.

The Chinese compute 7 telegraph poles for one Chinese li or ⅓ mile. According to this method of computation, the following results are to be had:—

Chinese li
$20805\div 7=2972=924$ miles.

b) The data gathered by travellers and others connected with the Chinese and Japanese military are as follow:—

Reports by	
Chinese Northwestern Army	1,101 miles
Capt. Yezoe (of Japanese Army)	1,066 „
M. Nakajima (a Japanese)	1,000 „
Nakamura (Osaka Mainichi Correspondent)	1,166 „
Capt. Kikuchi (of Japanese Army)	952 „
Capt. Uyeno (of Japanese Army)	933 „
„	966 „
„	1,200 „
Yuanho Yanghang (an American firm)	1,200 „
A student of the Tungwen College, Shanghai...	1,116 „
	1,150 miles on an average

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Remarks: (1) The figures given by the Northwestern Army and the Yuanho Yanghang are claimed to have been obtained each by the indicator of a motor car.

(2) The three different mileages given by Capt. Uyeno consist of one of his own surveying, the other two being obtained from Chinese sources.

(3) In short, the distance between Kalgan and Kulun may beput at 750 miles, as the crow flies; what may be called "beaten tracks" ranges about 1,000 miles.

The distances from Kalgan to points in Outer Mongolia and to others having trade relations with Kalgan are as under:—

a) From Records of old Chinese Authorities.

From Kalgan.

To Dolon Nor,	northeastward	156 miles.
Kulun	northward	968 „
Kiakta	northward	1,240 „
Chingpeng	northeastward	288 „
Hsuanhua	southeastward	20 „
Fengchen	westward	127 „
Taolin	westward	182 „
Yangkao	westward	76 „
Teshengkou	„	144 „
Changpeihsien	„	66 „
Suiyuan	„	246 „
Tatung	southwest	111 „

b) Motor Car Stopping Places and Tariff.

	Distance to next stopping place.	From Kalgan.
To Miaotan	30 miles	30 miles
Chiapushih	65 „	95 „
Pangkiang	81 „	176 „
Erhling	87 „	263 „
Wute	70 „	333 „
Saiwusu	77 „	410 „
Tsuiling	101 „	511 „
Tolokai	65 „	576 „
Kulun	99 „	675 „
Paiyangkou	98 „	773 „
Kiakta	103 „	876 „

Remarks: The motor car service now terminates at Kulun, although the plan to extend it further is pending.

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4) Transportation.

As previously hinted, a motor car service is maintained between Kalgan and Kulun, but the camel still remains the most important factor of the means of communications between the two places; next come ox-carts; and motor cars are used only where a traveller is in a hurry and does not mind the stiff charge. Of course, horse carts, too, are in considerable use, but this holds true mainly with the Chahar District. Few, who intend to proceed as far as Kulun, make use of horse carts. It may be remembered that the popularity of different kinds of means of communication varies according to the seasons. For instance, in spring and autumn, the camels take up 60% of the whole traffic, ox-carts 39%, and horse-carts only 1%; in winter most of the traffic is carried on with camels; whilst in summer ox-carts are the most popularly used to the extent of 80%, camels 15%, and horse-carts 5%.

Foot travellers are met with in the Chahar District, but very few, indeed, beyond.

Below, we may give a rough review of the principal means of communication :—

(a) Motor Cars. The Kalgan-Kulun motor car services, as maintained in the early part of November, 1920, were as under :—

	For	No. of cars	Remarks
Ministry of Communications	passenger traffic	70	Every fifth day, a car leaves Kalgan and Kulun.
Chinese Commercial Guild	"	30	Irregular, but mostly, every tenth day, a car leaves each end.
Yuanho Yanghang (American)...	"	50	The same as above.
Oil company (American).....	private traffic	10	Run when necessary
Chinese business houses (including Bank of China, etc.).....	"	20	"
Russian merchants		30 inclusive of three motor trucks	"
Mongolian princes	"	2	"
Koreans	"	2	"
Others (whose names are not available)		10	"

It may be added that any of the motor cars put down above as "for private use" will gladly offer passage in the car where there is room. Moreover, should one be willing to pay a reasonable sum, any of them may be pressed into special service for such party, excepting those owned by the Mongolian princes.

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Of the above mentioned, the cars included under the heads of "Russian merchants" and "Others" are, for most part, German manufactures, those belonging to the Commercial Guilds appear to be of French-make; and the others have been supplied by the Yuanho Yanghang (the American firm), and are said to be of the latest pattern.

As to the speed of the motor cars, when the road is level and in good condition, the speed of 30 miles an hour may be maintained, except when negotiating the hilly parts of the country. It usually takes an up-to-date American car about five days to complete a trip between Kalgan and Kulun, and from eight to fourteen days in the case of others.

The regular motor car services had to be suspended up to October last year from July preceding, in which month the Anfuites and the Chihli faction struggled for supremacy.

I happened to be travelling just at this juncture and was, naturally, subjected to great inconvenience both ways. On my homeward journey, I was lucky enough to get accommodation in one of the private cars carrying Russian refugees, but the car broke down on the way. I could change into another motor car, which, too, went out of order on the way. Such mishaps were repeated three times, and the intervening spaces had to be covered on camels' back or by ox-carts. Thus, fortunately I escaped starvation and other physical menaces, and managed to regain Kalgan in about twenty-five days.

One travelling by one of the cars belonging to the Ministry of Communications, the Commercial Guild, or the Yuanho Yanghang (the American firm), will find that there are always at least three fellow cars journeying with the one in which one has taken passage. Such being the case, even if one or two of the cars get damaged on the way, it will be in all likelihood a question of a short time to be wanted for the necessary repairing, before the party is ready to resume the journey, or one of a little longer time to be required for helping the crippled car along. The case will, however, be desperate with a solitary car travelling, and one should in such event be prepared to face the worst in the shape of either starvation or death from exposure. It should be borne in mind that native villages in Outer Mongolia are at least some 83 miles apart, and such being the case, a traveller must

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be provided with his or her own shelter and food, since there is no hope to receive supplies from an outside source.

As much depends on freedom from accident in traversing Outer Mongolia from Kalgan to Kulun in a motor car as a journey in an aeroplane.

Just how many motor cars have had to be abandoned on the way, damaged and inserviceable, is difficult to tell, but the writer himself has counted eight crippled cars given up for lost by the road side. This may give an idea of what dangers are lurking in the way.

One trip in a motor car costs S.¥120 in large dollars in ordinary circumstances. But, a passage in a private car sometimes costs a very stiff sum of money, according to circumstances. For my outward trip, I was charged S.¥175 in large dollars, and on my homeward trip, which had to be broken at a few places, the total fares I had to pay ran up to some S.¥500 in large dollars.

It was learned that, at the time I travelled, one trip fare was ordinarily S.¥250, and the stiffest was S.¥600.

The motor car fare is fixed for a complete trip between Kalgan and Kulun, and nothing definite is laid down for such as break journey on the way. Even when the car gets crippled on the way, there has been no precedent for refund of the fare, and so, when one meets with such accident on the way, one must lose the share for the remainder of the journey.

It was rumoured that the Outer Mongolia Resident's Office charges the Russians carrying on a privare motor service between Kalgan and Kulun no moderate sum on each car run each way. This sum is put at S.¥120. Before this tax came to be levied, something near the same amount is said to have been wanted to keep the motor service going.

In this connection, it may be noted that the Yuanho Yanghang, by which name the American concern is known) was the party, to whom the credit of opening the first motor service on this route is due. The same firm conducted the initial trial run in September, 1917, and was keeping it up vigorously, when in January, 1918, they were confronted with a protest from the Chinese authorities, and by March, 1919, they were permitted to operate only three cars for their own private purposes. Subsequently, as the national feeling of China has gradually improved towards the Americans, from four to six cars have come to be run at a

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time, and passage tickets have been offered for sale in public, but no further fuss has been raised by the Chinese authorities.

It is learned that the Peking branch of the Mitsui Bussan Kaisha, too, secured the privilege of operating two motor cars on the same route from the Chinese authorities in April, 1918. But, this privilege has not yet been turned to practical use.

A passenger's baggage is restricted to 10 *kin* (carried free of charge) outside the provisions he or she may take. But in consideration of a little *douceur*, to the chauffeur, the weight limit may be raised to fifty or sixty *kin*.

(b) Camels. As already stated, the camels plying between Kalgan and Kulun vary in number according to seasons. Moreover, no accurate data concerning them are obtainable. Judging by what materials there are at command and also by the actual observations, the number of camels having access to Kulun daily throughout the year appears to be in the neighbourhood of 250 to 260 head on an average. The number of days wanted for one trip is about 35 days, and therefore, the annual aggregate may be estimated as under:—

250 head × 70 days=17,500 head.

Now, the camels may be estimated to carry 400 *kin* (1 *kin* being 145 Japanese *momme*) each, the freight charge being S.¥30 in large dollars. Double the amount or something like it is charged, when a camel is hired for carrying a passenger, or for drawing a cart. The latter charges seem exceptionally moderate, considering the distance and other conditions. It is mainly because the camels are left to feed themselves on the way as best as they may, and no expense is incurred for feeding them.

The camel-drivers have an aversion to travelling in the day time. In ordinary circumstances, they start at midnight and will pitch their tents about 10 in the morning. The rest of the day is for the camels to find feed. By this means, the drivers may hope to secure immunity from wolves' raid at night, at the same time, being enabled to look after their animals in daylight with much greater ease.

The camel is one of the primitive animals. It can bear travelling without grass or water for four or five days. All that it needs in the meantime is a small quantity of salt. It will not take to running even under lashes of the whip. Nor

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will it get lazy even left alone. Looking knowing and peaceful, it will keep on striding (one stride covering 1 metre) on steadily. It is symbolic of both Continental slowness and primitive simplicity.

One peculiarity noticed in the camel is that it will not start marching, simply because the burden of freight goods has been put on the back. It will not move on with its back loaded, unless led by somebody. It will go on as long as some one is on its back. On this account, a camel, on whose back a man rides, must lead the way; and the others following must be led by means of ropes. Care should be exercised to know at once when the leading rope gets broken, for the liberated animals will then imagine themselves at liberty to remain where they are. It is said, on occasion, the lost camel has had to be recovered by sending some one after him for miles back. Each caravan has a bell fastened to the camel bringing up the rear. It serves the dual end of frightening away the beasts of prey prowling near by and of enabling the drivers to miss at once any of the animals lagging behind.

The number of the camels I came across on my outward and homeward trips (the former undertaken in September and the latter in October) was 730 head and 5,130 head respectively.

(c) Ox-carts. Like the camels, the ox-carts vary in number according to seasons. In gathering statistical figures for the ox-carts, greater difficulty is encountered than in the case of the camels. From available materials at hand and from my personal investigations, the number of the ox-carts may be placed somewhere half that of the camels. Those arriving at or leaving Kulun may be put at 120 to 130. Now, it takes an ox cart about sixty days to complete a trip between Kalgan and Kulun, and so the total number of them on the road at a time may be figured as under:—

120 head × 120 days = 14,400 head.

An ox-cart may load some 400 *kin*, the same as a camel. But, the charge is only S.¥20 in large dollars or two-thirds of that for a camel. This difference is owing to its slower speed.

In ordinary circumstances, seven or eight ox-carts are formed into a train, and each cart, excepting the foremost one, is fastened to the one immediately preceding it. Unlike the camels, the oxen invariably follow the lead of the foremost driver

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in moving forward and halts. No signalling is necessary. The meek and patient services rendered by these animals with apparent willingness tend to awake a feeling akin to attachment towards these animals.

On my northward (or outward) journey, I met with 730 carts, and on my southward (or return) journey 750.

These carts, like those in Inner Mongolia, are built apparently roughly, and may give a casual observer an idea that they will readily go to pieces. But, fact will falsify such an opinion more or less. A driver stated that a cart might need minor repairing not more than once a year.

(d) Horse-carts. The owners of goods consigned by a camel or ox-cart train may often accompany it in a horse cart, but usually they take a ride in a camel cart. For this reason only few horse-carts are found traversing Gobi Desert, and the Chahar district or up north to the distance of about 83 miles north of Kalgan only may be included in the zone in which horse-carts ply.

The horse-carts carry chiefly stocks of cereals accumulating on the Kalgan market, and in build and loading capacity as well, they are very much alike to their fellow carts in South Manchuria. They are in a good number, and I counted 350 of them on my northward trip (in September) and as many as 500 on my southward trip.

V. Post and Telegraph.

(a) Post.

The mails are received at, and despatched from, Kulun from/to Kalgan way generally once every five days with ordinary mails, and once a month with parcels. It takes some 10 days for ordinary mails and about 18 days for parcels between the two places.

The mail matters are not forwarded through what is known as the Mongolian stage system, but through a separate one maintained by the Chinese authorities. The courier contract is awarded to Mongolians.

The details of the Chinese courier system are as under:—

Between	Distance	No. of stages	Contract money
Kulun-Uliasutai	800 miles	10	S.Y1,200 per month.
Kulun-Kalgan	933 „	10	1,900 „
Kulun-Kiakta	233 „	3	600 „
Uliasutai-Kobuto	500 „	6	800 „

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Remarks: At each stage, a Mongolian hut with 7 head of horses is provided.

The accuracy of the above statement, which has emanated from a Chinese source, may be reserved for confirmation.

(b) Telegraph.

On the route from Kalgan to Kulun, post offices are found at Pangkiang, Wute, and Tsuiling (very often referred to on Japanese maps as Koulin). Messages are accepted in either English or Chinese at any of them. The telegrams may reach the destination on the same day on the Kalgan-Kulun route, but any from Kulun to, say, Peking or Tientsin will need twenty-four hours usually. However, this is the actual time wanted. The Chinese postmen and telegram-carriers expect *douceur* for their services, and a fixed resident who sends off and receives messages from time to time give these worthies *kumshaw* twice annually at the end of the half year. Others tip them each time. Without these encouragements, the delivery of mails and telegrams may be delayed on purpose.

The above is said to apply to a few officials of the post offices, and with this knowledge, delays may often be accounted for.

(c) Stage Inns.

At vantage points in Outer Mongolia, there are stage inns brought into being as facilities for Government people travelling. This institution dates back to the Ninth Year of Taitsu of the Ming Dynasty (1,376). It bears some resemblance to the Fifty-three Stage Towns on the Tokaido Road between Kioto (the Capital) and Yedo (the seat of the Shogunate Government) in old Japan.

One wishing to travel by the stage route in Outer Mongolia must be provided with passports issued by the proper authorities. In possession of a passport, even a private individual may be entitled to the same privileges as a Government official.

There are two kinds of stage routes. One starts from Kulun and leads to the seats of the local governments. The other is a network of such as connect the seats of the principality offices. Both institutions are for public benefit, quite above the ordinary business notions. Services will be rendered according to the entries in the passport as regards draught animals, inn accommodation, and food. No services need be paid for.

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Accommodating facilities are different according to stages; ordinarily there are from two to four Mongolian huts, each hut provided with about ten head of horses and camels and some food supply.

Speaking of the Uliasutai-Kobuto stage route, each stae has five huts and for each hut 58 horses, 114 sheep, and 8 camels are allotted annually in order to maintain the route.

On the Kulun-Uliasutai route, the huts at each stage generally number eight with a somewhat larger number of domestic animals.

When, for the transportation of troops and military stores, and for other purposes, what animals are kept at a stage are found insufficient, the stage inn manager is authorized to commandeer from the neighbouring villages the necessary men and draft animals on the strength of a previous notification from the proper authorities.

Each stage has stage master assisted by one clerk. There are several men for general work and also to serve as guides to the next stage.

For every ten stages, there is one stage-master general. These officials and other employees receive only sixty or seventy head of sheep annually from the Mongolian princes under whom they serve, besides the young that may be brought out by the domestic animals, together with bye-products such as hides and skins. They are also engaged in stock-farming on their own account so as to make both ends meet. As there are no carts or saddles obtainable at a stage, anyone intending to travel by one of the stage routes must provide himself with these requisites.

The stage inns between Kalgan and Kulun number forty-six. Formerly many travellers availed themselves of these inns, but since the opening of the motor car services, the stage route has been passing into gradual disuse.

It may be said, however, that in a thinly populated country like Outer Mongolia, such an institution like the stage route appears to be of use in effecting transportation and in maintaining communications.

In Thibet, Chinghai, etc., a like system serves as the only channel of communication.

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VI. Products.

(a) Agricultural Products.

It is worthy of notice that the Chahar zone yields agricultural products in a good quantity, and the agricultural zone is being rapidly expanded on the north year after year, especially due to the steady influx of settlers from different Provinces of China.

The contingency of Outer Mongolia being thoroughly reclaimed may not belong to the distant future.

The following is a table of agricultural products harvested in Outer Mongolia in a recent year:—

Wheat	1,700,000 *koku*	Indian Millet	630,000 *koku*
Oats	7,000,000 „	Beans	50,000 „
Buckwheat	350,000 „	Peas	400,000 „
Barley	100,000 „		
Kaoliang	200,000 „		
Millet	330,000 „		

Once one steps out of the Chahar District into Outer Mongolia proper, one may easily fall under the common delusion that the soil is barren, as the geographers refer to the district as Gobi Desert. As a matter of fact, however, most part of this region is suited to cultivation.

Yet, as things are, the only crops raised in Outer Mongolia are vegetables about Kulun, and wheat (estimated at about 20,000 koku) and vegetables between Kulun and Kiakta. Under such aircumstances, Outer Mongolia may well be regarded as quite neglected in agricultural lines.

There grows about Wute a natural herb resembling garlic, which is often styled "Mongolian onions." It is hardly worth being counted among the agricultural products, but it has a peculiar smell and eats well, both boiled and pickled. The natives ascribe to the herb the medicinal virtue of purifying the system and supplying calories.

Some of the herb has been taken home by the writer, and it has been submitted to the Military Hospital laboratory for analysis, the results of which have shown that, besides, it may give relief to women afflicted with complaints of their sex.

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(b) Stock Farming.

As regards the stock farming in the Chahar zone, there are some data available. Then, the results of the actual observations have been taken into account, and the live stock returns of the same zone are put down as under:—

Cattle	about 300,000 head	Horses	about 40,000 head
Sheep	„ 850,000 „	Mules	„ 20,000 „
Pigs	„ 350,000 „	Camels	„ 8,000 „
Poultry	„ 500,000 „		

The above table does not include what are attached to ox-and horse-carts.

As to what belongs to Outer Mongolia proper, there are no statistics to fall upon, and for this reason, the results of investigation widely vary according to those who make them.

For my own part, I have taken the average number of domestic animals kept by the inhabitants in Outer Mongolia and have figured out an estimate as under:—

		For a household	Average per household
Sheep	"A"	500 head	
	"B"	300 „	400 head
Cattle	"A"	15 „	
	"B"	5 „	10 „
Horses	"A"	5 „	
	"B"	3 „	4 „
Camels	"A"	3 „	5 „
	"B"	5 „	4 „

"A" refer to the average figures about Wute and "B" to those about Erhlien.

Computing the households in the four districts of Outer Mongolia (Chechenhan, Upper Hsiehtuhan, Sanyinnoyen, and Chasakotu) at 100,000, the desired data for the domestic animals are as follow:—

Sheep	40,000 head	Horses	400,000 „
Cattle	1,000,000 „	Camels	400,000 „

For reference sake, what animals have come within my ken on my recent journey may be given below:—

On Northward (outward) trip.

9,200 sheep; 3,500 cattle; 900 horses; and 800 camels.

On Southward (homeward) trip.

45,100 sheep; 1,300 cattle; 1,000 horses; and 500 camels.

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The 45,100 sheep noticed on the homeward trip included some 20,000 head which had been gathered by the caravans in payment for the goods sold by them. Of the 1,000 horses under the same head, 500 head belonged to the same category.

In addition, about Kulun, there is a breed of cattle, ferocious-looking, with hair on the belly hanging long, almost touching the ground. It is often called the Thibetan cattle. It is however, gentle in nature and is said to be more serviceable, when tamed, than ordinary cattle.

(c) Forestry Products.

As one leaves the borders of Chahar, the only thing that meets the eye will be the grassy plain as far as Kulun, save for only half a dozen trees worth the name. This may give a pretty keen idea of how scarce trees are over all that stretch. However, once one sets foot in Kulun, Mount Han, rising 2½ miles south, will be seen, covered with dense wood, the upper half with evergreen and the lower half with larch trees. In all, the wooded area is put at 125 square miles. This mountain is regarded as sacred and none but the privileged classes is permitted to transgress thereupon.

In the zone from Kulun to Kiakta, the mountains have mostly a wooded growth, although thin about midway between foot and top, the kinds of trees being much the same as on Mt. Han. The trees, for most part, range in size from that of an ordinary telegraph pole to two or three times as big.

Few people will be surprised to hear pine logs exported to Kalgan from the north of Outer Mongolia which is generally accepted as quite barren or bare.

One will understand the timber condition of these parts better when one sees with one's own eyes houses, fences, etc., all made of wood.

The groves and woods put out a kind of fungous growth much resembling *shiitake* (Japanese) or dried mushrooms, which is very good to eat. The output of this fungus is in a fair quantity. What is put on the Kulun market and is sent down to Kalgan thence is estimated at 20,000 *kuan* (or 166,666 lbs.)

There is a medicinal herb named *huangchin* (黃芩) found in this district. It is claimed to be akin in medicinal property to *ginseng* grown so abundantly in Chosen, and this claim is confirmed by chemical analysis. Next, another medicinal herb named *santsengtsao* (三層草) is said to be an antidote to snake-bites and a remedy for syphilis, etc. But, in neither case, the output is worth mentioning.

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(d) Miscellaneous.

Wild goats, hares, wolves, foxes, *talbagans*, etc., are found in good numbers. On my southward (homeward) journey, on two evenings, it might be about 9 o'clock, I passed within 400 or 500 metres of a pack of about a dozen wolves, and heard to my horror their dismal howlings for the first time in my life. I thought them not so frightful as I had imagined. A pack of dogs might have barked almost as ruefully to the bugle notes of "Lights out."

In my former travels in Inner Mongolia, I had come across a wolf twice. One of them was at only 6 yards ahead of me on a ledge of a hill just before daybreak. I got frightened for the moment, and it seemed the beast itself did no less. I made a rush at the beast with my walking stick, and the wolf fled in haste. Like a fox, the wolf ran, looking back at the pursuer. I got a notion then that the wolf is not a thing to be feared. At the time I mentioned, I was travelling alone, having parted from a Chinese caravan from Shanhsi as the outcome of a quarrel, and I took care to have a fire ablaze where I camped at night. Two days later, I met a south-bound Mongolian caravan, who, when informed of my little adventure, suggested that the wolves might have been quarrelling about the division of prey or some other prize, for they seldom howled in other circumstances.

VIII. Households and Population.

If there can be ever a hunt after vapor, the collection of statistics for things in Outer Mongolia may be likened to such a hunt.

Looking over the estimates of the population of Outer Mongolia, one places it in the neighbourhood of 1,500,000; a second at 1,000,000; a third at 800,000; and a fourth at 500,000. The difference is 3 to 1. Neither birth nor death is reported officially. No marriage or divorce can be expected to be reported. It would be only natural for Outer Mongolia to have no dependable figures in anything.

With the *tsoling* (佐領), the administrative unit of Outer Mongolia, for the basis of my calculation, I have obtained the following figures:—

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	No. of tsoling	From 21 to 60 years of age	Other inhabitants	Total
Chechenhan	48.5	66,105	74,545	140,650
Tuhsiehtuhan	57	93,765	105,735	199,500
Sanyinnoyen	38.5	57,904	65,296	123,200
Chasakotu...	24.5	26,485	29,865	56,350
Total	168.5	244,259	275,441	519,700

The number of inhabitants giving 150 men for 1 *tsoling* is put down as follows:—

Chechenhan, 2,900 Sanyinnoyen, 3,200 } average. 3,084
Tuhsiehtuhan, 3,500 Chasakotu, 2,300 }

The above calculation is grounded as follows:—

One *tsoling* in Mongolia consits of 150 men from 20 to 40 years of age, most of whom are the firstborn or the heads of families. Most of the remaining population became Lamaists according to the traditional custom. This custom has been losing its hold on the people gradually. Especially with the political changes, such as the downfall of the Manchu Dynasty, proclamation of independence under Russian protection, reversion to Chinese rule after the dissolution of Russia taking place one after another, the old custom has passed into a thing of the past, and now the strength of 1 *tsoling* is nine or ten times as large as of old.

In Inner Mongolia, the ratio of men from 20 to 40 years old and the rest of the population is about 47 to 53. On this ground, the inhabitants in 1 *tsoling*, including the older and younger males and the females, may be estimated to average roughly 3,084. The difference between the figures for the four districts is due to the difference in density of their population.

The present population of Outer Mongolia may be placed at about 520,000, of whom *shapi* (沙畢) under the direct control of the High Lama Priest, who stand outside the jurisdiction of the Mongolian princes, may be put at about one fifth of the total. The number of the households may be estimated at about 100,000.

IX. Towns and Villages.

(a) Kulun.

Matters concerning Kulun have been published by visitors and travellers, but here some of my personal observations may be given.

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Kulun is divided into Maimaicheng in the east, the Russian leased territory in the centre, and Western Kulun which is the commercial district-containing the mixed population of Lamaists, Mongolians, Chinese, and other nationals. It runs some ten miles from east to west, and is shaped like (=○=) It contains a population of 50,000, divided into 20,000 Lamaists (Mongolians), 15,000 ordinary Mongolians, 12,000 Chinese, 2,500 Russians, 400 Thibetans, and 100 foreigners consisting of Japanese, Britishers, Americans, etc. These figures date back to October, 1920, and since Kulun has been occupied by the combined Russian and Mongolian troops, the proportions of the inhabitants of different nationalities may have been altered more or less.

That, in the sparsely peopled Outer Mongolia, a city exists with a population of 50,000 might surprise any visitor to Kulun. His surprise will be more intense at the sight of the imposing summer and winter palaces for the High Lama Priest and his extravagant daily living.

Kulun has been the capital of Outer Mongolia and its political centre. In the past, its growth has been owing to the preponderance of its religious importance. However, the tide of modern civilization has been enfiltrating slowly, but steadily into this remote outlandish part of the globe, and a tendency has already appeared for the Mongolians vaguely awakening to the superstitious and mystic fabric of Lamaism. Lamaism may still retain much of its hold on the Mongolians, but its development appears to have been checked. It may not become extinct all at once, but seems doomed to gradual wane.

Some who are following the trend of events at Kulun are inclined to accept the destined decline of Lamaism as that of the city of Kulun itself. But, such a should be considered as hasty. Truly, Kulun may continue to decline in its view religious phase, but the city has a promising economic prospect.

The maintenance of the motor car services between Kulun and Kalgan may be regarded as precursor to the construction of a railway. At any rate, goods produced about Uliasutai, which used to be put on Kueihuacheng (Suiyuan) market in their entirety, has begun to be diverted to Kalgan via Kulun gradually.

American merchants backed with ample funds, who are established at Tientsin, have extended their commercial operations to Kulun via Kalgan and thence to Uliasutai.

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Politically speaking, the status quo may be maintained for some time to come. In the event of a railway being built between Kalgan and Kulun, to be extended in time to Verfne Udinsk in trans-Baikalia for connection with the Siberian Railway, it would be easy to foresee the grassy plain, which is now little better than for pasturage, reclaimed into fertile land under cultivation. Then the economic possibilities of Outer Mongolia would surpass the most sanguine expectations.

The exports and imports for Kulun are variable according to years, but may be tabulated roughly as under :—

Exports from Kulun.

November, 1920.

Sheep	160,000	head
Horses	25,000	„
Cattle	9,000	„
Wool of all kinds	3,150,000	lbs, difficult to tell distinctly between sheep's wool and goats' hair
Camels' hair	275,000	lbs.
Sheep's skins	485,000	pieces
Goats' skins	519,000	„
Horses' hides	70,000	„
Cow hides	156,000	„
Other skins & furs	230,000	„
Deer's antlers	1,000	pair, inclusive of what is exported from Kiakta
Musk	2,000	kin, inclusive of what is exported from Kiakta
Sheep's horn (used as medicine)	4,000	lbs. „ „ „
Maku (dried mushrooms)	208,333	lbs.
Pine timber	1,958,333	lbs.

Imports.

Silk fabrics	50,000	ft.
Cotton fabrics	600,000	„
Imitation native cloth	700,000	„
Tea	700,000	packages, one package weighing 85 kin.
Tobacco	4,000	
Sugar	666,666	lds.
Matches	70,000	dozens of boxes
Pork	32,000	kin.
Towels	20,000	dozens
Kerosene oil	15,000	cases, each containing two tins
Cow hides	24,000	pieces.

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Remarks: The above table indicates the trade for one year from September, 1919, to August, 1920. The transportation of the exports and imports, it may be calculated, was effected with camels, ox-carts, and others (mostly horse carts) at the rate of 60%, 39%, and 1%.

(b) Hamlets.

There are varying sizes of hamlets, the majority of them consist of five or six huts. At places twenty or thirty huts are found together, but they may be called more strictly a collection of a few hamlets.

The huts are built in much the same style as in Inner Mongolia.

The natives used to move about as their fancy led them, but recently many are settling down permanently at the same places. There is an obvious tendency to settle down at one place, unless under the force of special circumstances.

The distance from one hamlet to another also varies, but in ordinary cases, it is about 75 miles. For instance, in Chahar District, there are only five hamlets over a stretch of 1,000 miles between Pangkiang and Kulun. And this same section has much traffic as a telegraph road and is, so to speak, on one of the highways. Still, the distance dividing the hamlets is so great. This will show how thinly peopled Outer Mongolia is.

X. Currencies.

At places remote from towns or the highway, the value of a currency is still a thing unknown, and the only way of trade carried on is bartering. However, as the modern civilization slowly finds its way in the track of the motor cars, even among the Mongolians leading a primitive life, a good number of them know what the power of money is. Those living on or near the highway accept with high pleasure paper currencies, not to mention gold and silver coins.

In the line of currency, large dollars are the chief medium, and are followed by notes issued by the Kalgan branch of the Bank of China. Chinese small silver coins, too, circulate, but are so heavily discounted that they are not quite half worth large dollars.

In the interior of China, as is well known, all manner of paper notes issued by Government, Commercial Guilds, and private firms, are found on the market.

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But in Outer Mongolia, from ¥10 notes and ¥1 silver coins, down to 1 sen coppers, the major portion of currencies in circulation are large dollars and their subsidiaries, and they are uniformly of the decimal progression.

At a city like Kulun, not only domestic currencies, but also foreign monies are in circulation. Formerly Russian roubles were the only kinds in circulation, but since Russia's dissolution, the rouble note has lost all its credit and nobody cares to attach any value thereto.

The foreign currency that has made its appearance in place of the Russian rouble is the American gold dollar. Next come Japanese currency (the Bank of Chosen notes) which have found their way into Siberia. But, to large dollars, a discount of about 20% has to be allowed outside the current exchange rate.

XI. Foreign Merchants.

The Russians, who used to dominate the foreign trade in Outer Mongolia, have fallen from their pedestal since the dissolution of their country, and the ground once occupied by them is being appropriated by Chinese and other foreign tradesfolk, which latter are mostly Americans. The majority of them have long resided at Tientsin or Kalgan and are well versed in matters concerning Outer Mongolia. They understand both Chinese and Mongolian and may have lived about the places of their business for twenty-five or twenty years. Save for the physical characteristics of their race, these merchants are almost as familiar with the local conditions and peculiarities as the natives themselves. This point has given the American a superb advantage. That the Japanese businessmen have always to compete at a serious handicap with these Americans is due in a large measure to the constant shifting round of the agents or representatives of the Japanese business houses engaged in Mongolian trade.

The American merchants set up in active business at Kulun are the Yuanho Yanghang, the Lungchang Yanghang, Shenchang Yanghang, and the Standard Oil Co. of New York. They have each immense capital at its back. Excepting the Standard Oil Co., the others have extended their operations as far as Uliasutai where they have opened branch offices. The remarkable point of their business activity lies in its steadiness and permanence.

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In fact, they opened operations on a large scale in 1919, when Kulun was suffering worst from dearth of supplies, and the only ware in the market consisted of cheap inferior Japanese manufactures. Accordingly, the prices were ludicrously high, and a pair of leather shoes, for instance, was quoted at $30 in large dollars.

Under like circumstances, Japanese tradesfolk might have charged much stiffer prices. The American bussinessmen added to the cost price only some 30% profit, and sold at less than half the prices ruling. They would say: "All we want is a reasonable profit. We don't want extortionary profit. Compare the ware on the market with our own and judge for yourselves."

Thus, the Americans were received with open arms and have built up a sound reputation.

I learned to be puzzled over the sales prices of these American goods about Kiakta and the market prices at Tientsin and Kalgan. On making enquiry, I was informed that they were willing to put up with more or less sacrifice, especially as no other nationals would think of competing with them. The opportunity was indeed worth improving. One of them went on explaining: "We represent the American merchants and mean to work for their sake, but not for our individual interest alone."

With such men working hard as pioneer traders, it may be well understood why the scope of American business influence is expanding in China everywhere.

In addition to the above four firms, there were several residing at Kulun, who acted as agents for their principals. More foreign firms looked likely to open their offices there.

XII. Customs.

(a) Marriage.

Marriage is arranged as in Japan up to a certain point. Friends or relatives assume the office of go-between, and the match is subject to the final approval of the parents of the young couple. Thus far the customs in Outer Mongolia and in Japan are alike. But in Outer Mongolia, neither bride-to-be nor bridegroom-to-be, is taken into confidence by the parents regarding their approaching fate. All they can do is to guess from the way the parents act. Indeed, there is such a thing as the "preliminary meeting," but it is for the parents, and not for the young couple.

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On this account, neither of the future husband or wife can ever have an iota of idea what his or her future consort may look like.

The Lama priests preside at all ceremonies in Outer Mongolia. The wedding ceremony is no exception. It is opened with the incantations of the officiating priest and ends with the same.

In Outer Mongolia, more than two couples live in one hut or, more strictly speaking, in one chamber. In most cases, they are brothers and wives.

(b) Food without Salt.

The staple food of Mongolians consists of milk, boiled mutton, and roasted millet. While at home, more or less salt is taken with food. But those travelling with ox-and horse-carts or camels abstain from salt. They explain that salt causes thirst and thirst in traversing a country giving little water is a curse. They essay travels lasting 70 to 80 days at a stretch, and do not take quite a spoonful of salt in all that time. Still no effect on their health is noticed. I myself partook of their food while travelling, and came out as well as they. Then at home or abroad travelling, the Mongolians take very little of vegetables. Still a number of them live beyond 80 years of age.

(c) Female Toilette.

A married woman has her hair dressed in a way much resembling in shape the horns of the buffalo. Wooden pieces are used to fashion the hair. This strange way of hair dressing is said to take two or three persons for half-a-day. In consequence, the washing of one's hair is indeed a rare event taking place once or twice in life, it is said.

As to complexion, many are rosy-cheeked and look quite handsome.

It may be because of such way of dressing one's hair that a good many women get bald on the top of their heads once they pass on to the wrong side of thirty. By about 40 years of age, many become absolutely bald.

The woman's frock has a sort of pad on each shoulder and will take many days to make one. This piece of clothing is seldom washed.

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(d) Long Distance Races.

The Mongolians are born rough-riders. When galloping on a fine horse, its legs appear not to touch the ground at all. Walking is hateful to them. Once outside the threshold, a Mongolian from a child gets astride a pony and flies off. Small wonder, they are capital equestrians. The females are almost as good riders as the males.

The chief diversions and accomplishments of the Mongolians are races and wrestling. In wrestling, they wear furs and have no rings to wrestle on. Besides, no one is declared beaten unless one is thrown down. In other respects, the game is very much like the Japanese way of wrestling.

In races, long distance races are usually run.

Annually, on the 21st and 22nd of the Sixth Moon, at about 30 miles northwest of Kulun, races are run over a distance of 25 miles and back, making the total mileage 50 miles. At the goal, the High Lama Priest and the Mongolian princes are present in great pomp on the grand stands. The riders regard their participation in the annual races as one of high honours, and it is said that from accident or from overexertion, a few, sometimes as many as four, fatalities take place during or immediately after the races. Even in the sparsely populated Outer Mongolia, a crowd of 100,000 spectators is said to flock to the race ground.

(e) Strange Thibetan Greeting.

The Thibetan customs are full of strange and ludicrous features. When two Thibetans meet on the road, each will stop within a few paces of the other, take off the cap and hold it in the right hand, loll out the tongue at the right end of the mouth and turn it to the left end. Imagine the sight of such a way of cordial greeting between young people of the opposite sexes of a marriageable age!

XIII. Conclusion.

It is true that Outer Mongolia lies still dormant and unopen. It is no less true that it lacks means of rapid communication. Surely, the motor car services have been started, but they are available only along a strip of land. Outer Mongolia awaits human exploitation—to be reclaimed, opened up, and enlightened.

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Some ignorant geographer of Japan bedaubed Outer Mongolia Gobi Desert, and many Japanese have put the wrong notion in their head that there is little left in Outer Mongolia outside the barren Gobi Desert. Such a misconception has been falsified by the reclamation of wide tracts of land northward from Chahar at a rapid pace year after year. Even about Erhlien, Wute, and Tsuiling, the Chinese settlers are growing their own vergetables which thrive as well as near Kalgan. Farther north, between Kulun and Kiakta, wheat and various kinds of rape are cultivated. All these facts corroborate the statement that Outer Mongolia is rich in agricultural potentialities.

USEFUL MINERALS & THEIR DISTRIBUTION IN SOUTH MANCHURIA.

By Mr. B. Toheida.

The principal mineral products of South Manchuria are gold, iron, coal, and other applied minerals.

Of all of them, what was worked most popularly was to gather placer gold. But nowhere was it operated on a large scale, and none held a fine promise. The best known places for these deposits are Chiapikou in the Sungari Valley, belts in Tunghua and Huaijen in the valley of the Hun, a tributary of the Yalu River, Wufenglou and Wantientzu on the Upper Hun River running north of Fushun, belts in the Huifa River Valley, and the valley of the Chai River flowing just north of Tiehling, in each of which places a good amount of placer gold has been recovered from of old.

As gold veins, Chiapikou, Paomachuan (38 miles south of Tunghua), Hsiangluwantzu (about 12 miles southeast of North Shanchengtzu), etc., were operated vigorously at a time, but now all of them lie quite neglected.

At other places much prospecting and experimental working have been conducted, but none of the enterprises has been sustained, and not a mine of a decent magnitude seems to have been yet struck.

As to iron mines, the belts about Anshan (the seat of the Anzan Iron & Steel Works of the South Manchuria Railway Company) and Kungchangling Pass, about

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midway between Liaoyang on the Main Line and Penchihu on the Mukden-Antung Line, are the principal ones.

The iron ore bearing rocks of the Anshan district are wholly included in the hematite-quartz-schist, which is pre-Cambrian. The iron percentage is not high, but they are found in immense quantities. Moreover, rich ore zones giving more than 60% of iron occur here and there.

At present the Anshan ores are being mined as material for the Anzan Iron & Steel Works.

Next, as to Kungchangling Mine, it is being prospected by the Kungchangling Iron Mining Co. organized under Sino-Japanese joint auspices.

The ore for the Penchihu Colliery & Mining Co. is obtained mainly from Miaoerhkou at 25 miles southeast of Penchihu.

Besides, iron mines are scattered over the northeastern part of the Yalu Valley, along the Upper Taitzu east of Penchihu, and also in the Kwantung Leased Territory. However, want of transportation facility, the niggardly quantity of the minerals, or their inferior quality put them outside the province of extensive mining.

As for metallic minerals, silver, lead, copper, iron pyrites, etc., are found, but none of the deposits is suited to mining on a large scale. Their veins or seams run in irregularly varying dimensions so much so that little can be made sure of any of them as to its value as a commercial asset.

In the present situation of Manchuria, Coal may well take the first place on the list of the principal mineral products. The major portion of its mineral outputs consits of Coal. The names of Fushun, Yentai, and Penchihu Coals are already widely known.

Coal in South Manchuria may be classified, according to the periods of its formation, into what belongs to the Permo-Carboniferous Period, the Jurassic Period, and the Tertiary Period.

What belongs to the Permo-Carboniferous Period is chiefly found in Liaotung Peninsula south of Fengtien (Mukden) in separate basins of small extent. The output is mostly anthracite or semi-anthracite. In many cases, a dozen or more coal seams lie overlapped one over another and are worth exploiting.

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Especially, Penchihu Coal has a high calorific power and is suited to the manufacture of cokes of splendid grade.

The common defect of the coals belonging to this Period is that they contain sulphur and is brittle (although there are some exceptions). Then, they occur in varying thickness, which circumstance causes no small inconvenience to operation.

Next, what belongs to the Jurassic Period lies, in the main, in the north of South Manchuria. Takata Colliery in Hsian Prefecture in what is known as the Tungshan (Eastern Hill) District, to the east of Kaiyuan, may be held up as representative of this class. The coal of this class contains most moisture and is the nearest approach to lignite, with a comparatively low calorific power.

That which belongs to the Tertiary Period occurs in the Hun Valley only. Its chief exponent is Fushun Coalfield, and the others are good enough only for primitive mining by the natives.

The Fushun Coal seam has an unparallelled thickness, and the coal is bituminous and rich in volatile matter. It is adapted to the production of gas and is also rich in nitrogen. Among its other characteristics, the rather high percentage of moisture and insufficient cohesion may be counted as its only shortcomings.

Talking of applied minerals, magnesite, barytes, asbestos, talc, fluor spar, fire-clay, kaolin, felspar, etc., may be mentioned. Of the above, magnesite and fire-clay are of high importance.

Limestone is come across at every turn and is used for making lime and cement.

Quartzite is distributed everywhere in Liaotung Peninsula, especially about Dairen and Ryojun (Port Arthur). At places, it may be utilized as material for the manufacture of dinas brick and glass.

Glass manufacture has been conducted at the S. M. R. Co. Ceramic Experimental Institute, Dairen, by way of experiment and with a fair measure of success.

In the line of building stone, granite, gneiss, and limestone, etc. are found, and are extensively used for architectural and earthwork purposes.

Cryptozone limestone, a kind of limestone, which has been found recently about Chinchou (near Nanshan, the battle field at an hour's train journey from Dairen) is being used popularly for ornamental purposes.

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A. Metallic Minerals.

1. Iron.

LOCATIONS:

a) Yuhsikou (at about 3 miles southwest of Tungyuanpu on the Mukden-Antung Line); magnetite of passable quality found only in a meagre quantity; mining concession held by Penchihu Colliery & Mining Co.; operation commenced in 1919, but suspended at present.

b) Miaoerhkou (at 5 miles east of Nanfen on Mukden-Antung Line); magnetite and hematite of passable quality found in a fair quantity; mining concession held by Penchihu Colliery & Mining Co.; now under operation, daily output being about 200 tons of rich ore.

c) Anshan (at about $5/7$ mile south of Anshan Station on S. M. R. Main Line); magnetite and hematite of passable quality found in a considerable quantity; mining concession held by Anshan Iron Mine Chenhsing Co. under Sino-Japanese joint management, now under operation, outputs being supplied to Anshan Iron & Steel Works.

d) Kungchangling (about midway between Liaoyang on Main Line and Penchihu (on Mukden-Antung Line); magnetite and hematite of passable quality found in a considerable quantity; mining concession held by Kungchangling Iron Mine Co. under joint management of South Manchuria Enterprise Co. and Mr. Li-kuanyung (Chairman of Fengtien Provincial Assembly); prospecting in progress.

e) Talitzukou (at about 13 miles southwest of Maotzushan); hematite of fine quality found but in niggardly quantity; no one holds concession to work it, it being in land under cultivation, output being supplied to native foundries near by.

f) Chitaokou (at about 7 miles southeast-east of Tunghua); hematite of passable quality found in only niggardly quantity; no one holds concession to work it, it being in land under cultivation, output being supplied to native foundries near by.

g) Kuangtungtzu (at 15 miles north of Panshih); magnetite of passable quality found only in small quantity; mining concession held by the Hsinga Foundry (a Chinese company); was mined about 1915 and output was made into iron, but venture proved failure, and work under suspension.

2. Gold.

LOCATIONS:

a) Tuchiatun (at about 18 miles southwest of Pitsuwo in northeastern corner of Kwantung Leased Territory); gold of indifferent quality found in small quantity; mining concession held by a Japanese of name of G. Inukai.
Suichiatun (between Tuchiatun and Yuanchiatun); gold of indifferent quality found in small quantity; mining concession held by the same Japanese as above mentiond.

b) Laotiehshan (at southern extremity of Kwantung Leased Territory and south of Ryojun, (Port Arthur); gold and placer deposits of indifferent quality in small quantity; mining concession for gold held by Kwantung Government and that for placer deposits by a Japanese named R. Horiuchi.

c) Yuanchiatun (at about $2\frac{1}{2}$ miles northeast of Pulantien); gold of indifferent quality in small quantity; mining concession held by a Japanese named G. Inukai; work under suspension and mine held by a Japanese named K. Toda, who financed operation.

d) Wufenglou (at about 30 miles northeast of Hsingking); gold and placer deposits of indifferent quality in meagre quantity; about 1917, a Chinese firm under style of Hsingli Kungsu worked it for a time.

e) Changkang (about midway between Antung and Kuantien); gold and placer deposits of indifferent quality in niggardly quantity.

f) Hsiangluwantzu (at about 12 miles southeast

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of North Shanchengtzu in so-called Tungshan (Eastern Hill) District; gold and alluvial deposits of passable quality found in a fair quantity; mining concession held by a Chinese concern under style of Hsingkuo Kungsu; difficult of mining after reckless operation.

g) Paomachuan (at about 38 miles south of Tunghua); gold and alluvial deposits of passable quality found in fair quantity; mining concession held by Huachang Kungsu, Chinese firm; difficult of mining after reckless operation.

h) Chiupikou (at 30 miles east of City of Kirin); gold and alluvial deposits of passable quality in fair quantity; land, in which mine is located, held by an influential Koran family whose head is named Kantohkyo; difficult of mining after reckless operation.

i) Meichiatun (1.2 miles southeast of Sanshihlipu in Kwantung Leased Territory); placer deposits of indifferent quality found in small quantity; none holding mining concession.

j) Chinchangtun (at about 13 miles northeast of Pitsuwo); placer deposits of indifferent quality in small quantity; nobody holding mining concession.

k) Sampatan (at about 7 miles east of North Shanchengtzu, above mentioned); placer deposits of passable quality found in niggardly quantity; nobody holding mining concession; up to about 1916, a Chinese firm (Paolung Kungsu) worked it

l) Wangerhshan on the Upper Yalu, placer deposits of passable quality in niggardly quantity; Bush Bros (British concern) interested in the mine.

m) Tamiaokou (at 5 miles south of Tunghua); placer deposits of passable quality found in small quantity; Bush Bros also interested in the mine.

n) Chaihopu (at 20 miles east of Tiehling on Main Line); placer deposits of passable quality in meagre quantity; nobody holding mining concession; up to about 1914, the mine was vigorously worked by Chinese and some Japanese also concerned in working it.

3. Copper.

LOCATIONS:

a) Tungkuangling (at 18 3/3 miles below Antung along the Yalu); copper pyrites of fine quality found in small quantity; concession held by a Japanese named Dr. C. Uchida; mostly left neglected; worked at times, output being sold to the Refinery at Chinnampo, Chosen.

b) Pichoushaotzu (at about 126 miles above City of Kirin on the Sungari); copper pyrites of fine quality in small quantity; mining concession held by Pichoushaotzu Copper Mining Co. (a Chinese concern); work under suspension.

c) Santaokou (at 27 miles northeast of Kuantien); copper pyrites of fine quality found in small quantity); nobody holding mining concession; work under suspension.

d) Panling (at about 18 miles northeast of Tsaohokou); copper pyrites of passable quality in meagre quantity; mining concession applied for by Sino-Japanese Mining Co. under joint management.

e) Panshih (at about 12 miles northeast of Mapanshan (a mountain); copper pyrites and malachite of fine quality found in meagre quantity; mining concession held by Panshih Copper Mining Co.; work under suspension.

f) Malukou (at 42 miles east of Penchihu); copper pyrites of passable quality found in small quantity; mining concession held by a Chinese named Pao-shen; Okura-gumi (Baron K. H. Okura, the head) holding contract of mining and selling outputs.

g) Sutzuhuoko (or Tachaitzu) (at about 32 miles above Tiehling on the Chai River); copper pyrites of fine quality found in small quantity; mining concession held by Kaiyuan under Sino-Japanese joint management; about 1916, Mr. K. Matsuoka of Tiehling experimentally worked it.

h) Tienpaoshan (at ten miles southwest of Lao-

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toukou, Chientao); copper pyrites and argentine of passable quality found in a fair quantity; mining concession held by the South Manchuria Development (Tahsing) Co.; work in progress; equipped with a refinery of an extensive scope.

4. Lead.

LOCATIONS:

h) Hsiaotientzukou (at about 8 miles north northeast of Chungku on Main Line); lead of fine quality found in small quantity; mining concession held by a Chinese named Hsu-kofang; work under suspension.

j) Tiennankou (at 25 miles west of Tungyuanpu on Mukden-Antung Line); lead of fine quality found in small quantity; mining concession held by Sino-Japanese Mining Co.; work in progress.

k) Chingchengtzu (at about 27 miles west of Tungyuanpu); galena and iron pyrites of fine quality found in small quantity; concession held by Sino-Japanese Mining Co.; prospecting work in progress.

l) Laojenkou (at about 12 miles southeast of fine quality found in small quantity; concession held by nobody.

m) Erhpengtientzu (at about 12 miles southeast of Huaijen); lead of fine quality in small quantity; concession held by nobody.

5. Iron Pyrites.

a) Pyrites occur at several places, but nowhere it is found on a scale worth mentioning.

B. Non Metalliferous Minerals.

1. Coal.

LOCATIONS:

a) Wuhutsui (at 23 miles west of Pulantien on northern border of Kwantung Leased Territory); semi-anthracite, non-caking, of passable quality found in meagre quantity; mining concession held by a Russian, from whom Tayih Kungsu has leased, and it is under exploitation.

b) Tungchiakou (at 15 miles northeast-east of Chinchou); semi-anthracite, non-caking, of indifferent quality found in meagre quantity; concession held by Mr. Kinizuka, a Japanese; work under suspension.

c) Tsotzuyao (at 2 miles east of Wafangtien Station), bituminous coal, non-caking, of indifferent quality found in small quantity; concession held by South Manchuria Railway Company.

d) Fushun (at end of Fushun Branch Line); bituminous coal, slightly caking, of fine quality found in immense quantities; concession held by South Manchuria Railway Co.

Outside Fushun mining area, there are Talien Colliery, concession for which is held by South Manchuria Development (Tahsing) Co. and operated by Oriental Coal & Mining Co. which also acts as sales agent; Achinkou colliery (concession for which is held by Chouwenkuei, resident of Dairen); Piaoerhtun colliery (concession for which is held by Junhsing Kungsu and Nanchang Yoko.

e) Yentai (at 9 miles east of Yentai on Main Line); semi-anthracite coal, non-caking, of passable quality found in fair quantity; concession held by South Manchuria Railway Co.; under operation.

Outside the Company's mining area, there is Weimingshan colliery, concession for which is held by Tienli Kungsu, daily output being about 100 tons.

f) Penchihu (close to Penchihu Station on Mukden-Antung Line); semi-anthracite coal, caking, of fine quality found in fair quantity; concession held by Penchihu Colliery & Mining Co.; under operation.

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g) Niuhsintai (at 10 miles east of Penchihu); anthracite coal of passable quality found in fair quantity.

Concession for eastern district held by Tsaiho Kungsu, a Sino-Japanese company; western district, which is Chinese mining area, is worked by a Japanese concern; Yuhsin Kungsu, which also acts as sales agent for output.

h) Hsiaoshih (at 40 miles above Penchihu on the Taitzu River); semi-anthracite coal, non-caking, of passable quality found in fair quantity; nobody holds concession to work it.

i) Saimachi (at 53 miles southeast of Penchihu; semi-anthracite coal, caking, of passable quality found in meagre quantity; concession held by Shuanghoyu Colliery Co., which is under contract with Oriental Coal & Mining Co., the latter working it and selling output; worked in native fashion.

j) Tienshihfukou (55 miles east Penchihu); anthracite & semi-anthracite, slightly caking, of fine quality found in fair quantity; concession held by Fuhua Kungsu and three individuals, who have given contract to Penchihu Colliery & Mining Co. to work it and sell its outputs; operated on native method and output sold locally.

k) Tataishan (1½ miles northwest of Tiehling); lignite, non-caking; of passable quality found in small quantity; concession held by Huasheng Kungsu; work under suspension.

l) Ilu (nealy 2½ miles east of Hsintaitzu Station on Main Line); lignite, non-caking, of passable quality found in small quantity; nobody holds working concession. Formerly Aishang Kungsu (a Japanese concern) was interested in it.

m) Shahotzu (nearly 4 miles northeast of Changtzu); lignite, non-caking, of passable quality found in meagre quantity; concession held by Tunghsing Mining Co. (under Sino-Japanese management.)

n) Takata (1½ miles north of Takata in Tungshan (Eastern Hill) District); lignite, slightly caking, of fine quality found in fair quantity; concessions held severally by Paohsing Kungsu, Fukuo Kungsu, Yuhsing Kungsu, Tacheng Kungsu, Yuhua Kungsu, & Chuanyi Kungsu. Moreover three applications for mining it on file; total annual output placed at about 60,000 tons.

o) Taolu (several collieries located at about 8 to 15 miles north of town of Taolu); lignite, slightly caking, of fine quality found in fair quantity; that part called Yatzuchuan operated by Tiencheng Kungsu and Mingshengfeng, concessionaires. Tapingling worked by Futai Kungsu; and Hsiao Lishuhotzu operated by Fengpei and Fengtung Kungsu; under operation on native method; total annual output, about 10,000 tons.

p) Shansungkang (at 23 miles southeast of Chaoyangchen); semi-anthracite of passable quality found in meagre quantity; mining concession held by Tahsingyao and thirteen others; mining work under suspension.

q) Panchiehkou (at 30 miles north northeast of Liuho); semi-anthracite of passable quality found in small quantity; nobody holds mining concession.

r) Hsienjenkou (at 13 miles south southeast of Liuho); semi-anthracite, caking, of passable quality found in small quantity; no one holds mining coneession.

s) Tienhotun (at 8 miles southwest of Kuantien); semi-anthracite, caking, of passable quality found in fair quantity; concession under application by R. Minehata (a Japanese) and Li-hsienhsien (a Chinese).

t) Wulungtun (at 67 miles south-southeast of Kirin); lignite, non-caking, of fine quality found in fair quantity; mining concession held by a Chinese concern named Tehsing Kungsu; work under suspension.

u) Tiehchang (20 miles northeast-east of Tunghua); semi-anthracite, caking, of fine quality found in meagre quantity; concession held by Paotai Kangsu and others; worked in native style.

v) Kangyao (33 miles north-northeast of Kirin);

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lignite, non-caking, of indifferent quality found in fair quantity; under joint management of Liu-tungkang (a Chinese) and J. Uchigaki (a Japanese); worked in native style, the total annual output being only 200 tons.

w) Huasluihling (at 2⅔ miles north of Yingchengtzu on Kirin-Changchun Railway); lignite, non-caking, of passable quality found in fair quantity; concession held by Paochi Mining Co. (a Chinese concern); daily output, between 20 and 30 tons.

x) Kwanchengtzu 1) Shihpeiling, about 9 miles east of Changchun; 2) Taochiatun, about 13 miles southeast of Changchun; lignite, partially caking, of passable quality found in fair quantity; concession held by South Manchuria Railway Company; Shihpeiling colliery under operation by South Manchuria Mining Co.

y) Shansungpei in Chientao (20 miles north of Kwainei, the terminus of the proposed Kirin-Kwainei Railway); lignite, partially bituminous, of inferior quality found in meagre quantity; concession held by Huasheng Kungsu (a Chinese firm); work under suspension.

z) Laotoukou in Chientao (about fifteen miles west of Chutzukai); lignite, non-caking, of passable quality found in fair quantity; concession held by South Manchuria Development Co.; Yenchi Mining Co. (Chinese) and a few other worked it in native fashion.

A) Tayaokou (30 miles southwest of Chinchow this side Shanhaikwan, accessible by a light rail line laid by Tungyu Kungsu (a Chinese firm) from Nuerhho Station on Peking-Mukden Line of Chinese Government Railways): bituminous coal, non-caking, of fine quality found in meagre quantity; concession held by Chinhsi Colliery Co. under Sino-Japanese joint management; under operation, daily output being about 80 tons.

B) Hunglohsien (15 miles southwest of Chinchow this side Shanhaikwan); semi-anthracite, non-caking, of passable quality found in meagre quantity; concession held by Aishang Co. and a few others; worked in native fashion.

c) Nuangtitang (25 miles southwest of Chinchow this side Shanhaikwan, the major portion of the mine belonging to Chaoyang Prefecture); semi-anthracite, non-caking, of passable quality found in meagre quantity; concession held by the Peking-Mukden Line of Chinese Government Railways; under operation by natives who have leased it.

D) Hsinchiu (46 miles northwest of Lichiawopeng on Peking-Mukden Line of Chines Government Railways); lignite, non-caking, of fine quality found in fair quantity; concession held by Tahsin Kungsu, Tahsing Kungsu, etc.; modern mining equipments being planned to be installed; besides, there are a few pits worked in native fashion, yielding about 160 tons daily.

2. Magnesite.

LOCATIONS:

a) Chuanshantzu (2 miles due north of Shakang on Main Line); of fine quality found in fair quantity; concession held by Anshan Chenhsing Co. (under Sino-Japanese management), South Manchuria Railway Company, too, being interested.

b) Paihushan (about 3 miles due south of Tashihchiao); of fine quality found in fair quantity; concession held by Chenhsing Co. S. M. R. Co., too, being interested.

c) Kuanmashan (3½ miles east of Tashihchiao); of fine quality found in large quantity; concession held by Ho-changching; worked at times.

d) Near Taling (4⅔ miles northeast of Tashihchiao); of fine quality found in large quantity; concession held by Yu-chunghan (a Chinese), S. M. R. Co., too, being interested.

e) Near Huashihchin (about from 9 to 14 miles southwest of Haicheng on Main Line); of fine quality found in large quantity; concession held by Yuchunghan, S. M. R. Co. too, being interested.

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d) Chinmaku (from 12 to 14 miles south-south-east of Haicheng); of fine quality found in large quantity; concession held by Yu-chunghan, S. M. R. Co. too, being interested.

3. Dolomite; 4. Limestone; 5. Quartzite.

The three kinds of rocks abovementioned being widely distributed in a large variety in South Manchuria, any of them may be obtainable without difficulty, if sought in the right quarter.

6. Clay.

LOCATIONS:

a) Yentai (running parallel to Yentai coal seam); fire clay of fine quality found in fair quantity; concession held by South Manchuria Railway Company; under operation.

b) Wuhutsui (being located within Wuhutsui Coal field 30 miles southeast of Fuchou); refractory clay of fine quality found in fair quantity; concession held by Yiho Clay Co., Tatung China-clay Co., and Tungyi Pottery Co. (all Chinese), in all of which S. M. R. Co., too, is interested more or less; work under suspension.

c) Tumenling (2/3 mile north of Tumenling Station on Kirin-Changchun Railway); porcelain clay of fine quality found in fair quantity; investigation in progress.

7. Asbestos.

LOCATIONS:

a) Hoshangtun (about 5 miles east of Chinchou in Kwantung Leased Territory); of fine quality found in small quantity; concession held by Japan Asbestos Co.; work under suspension.

b) Tahuangkou (1 mile northwest of Tahuangkou in Kuantien Prefecture); of fine quality found in meagre quantity.

8. Fluorite.

LOCATIONS:

a) Luchiatun (5 miles south southeast of Luchiatun in Kaiping Prefecture; of fine quality found in meagre quantity; concession held by a Chinese; Shimakyu, Druggists, Dairen, acting as sales agent.

b) Tsuichiatun (3 1/3 miles west of Luchiatun); of fine quality found in meagre quantity; concession held by a Chinese; Shimakyu, Dairen, acting as sales agent.

c) Laomukou (6 2/3 miles south of Haicheng Station on Main Line); of fine quality found in small quantity; concession held by Kungy Kungsu, Haicheng; work under suspension.

9. Talc.

LOCATIONS:

a) Sungchiaputzu (at 10 2/3 miles south of Haicheng on Main Line); of fine quality found in fair quantity; mining concession held by Yu-chunghan, S. M. R. Co., too, being interested; worked at times.

b) Chingtzuku (at about 8 miles over the hills, and about 18 miles over the cart road, south of Haicheng); of passable quality found in fair quantity; mining concession held by Yu-chunghan, S. M. R. Co., too, interested.

c) Maku (at 14 miles south of Haicheng and situated opposite Huashihling), of fine quality found in fair quantity; concession held by Yu-chunghan, S. M. R. Co., too, being interested.

10. Felspar.

LOCATIONS:

a) Lienchiakou (at 2 1/3 miles east of Shihho in Kuantung Leased Territory); of fine quality found in meagre quantity; no one holds mining concession.

b) Shihtashan (at 6 2/3 miles south southeast of Haicheng); of passable quality found in fair

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quantity; concession held by Chenhsing Kungsu; output under experimental use at Ceramic Experimental Institute of S. M. R. Co.

11. Soda.

LOCATIONS:

a) Near Tsitsihar (in the Nen Valley east of Tsitsihar; of fair quality; no reliable estimate obtainable as to its quantity; nobody holds concession.

b) Palishan (in Wentu Principality and belongs to Chengchiatun in Liaoyuan Prefecture); of passable quality; no reliable estimate obtainable as to its quantity; concession held by no one.

c) Tapusu (in South Kuoerhlossu at about 53 miles and southeast of Taonan); of passable quality; no reliable estimate obtainable as to its quantity; concession held by no one.

ECONOMIC CONDITIONS OF TAONAN.

By Mr. K. Murata.

I. Rough Review.

(A) Location, Boundaries, and Area.

Taonan is part of the open district of the principality of Chasakotu. It borders on Ankuang Prefecture (the distance to the seat of Prefectural government being 46 miles) on the east, on Tuchuan Prefecture (the distance to the seat of Prefectural government being 63 miles) on the west; on Chanyu Prefecture on the southwest (the distance to the seat of Prefectural government being 66 miles); on Kaitung Prefecture (the distance to the seat of Prefectural government being 46 miles) on the south; and on Taoan Prefecture (the distance to the seat of Prefectural government being 20 miles) on the north. The district adjoining on the northwest consists of the unopen portion of the Chasakotu principality.

Taoan Prefecture is from 33 to 50 miles from east to west and from 17 to 43 miles from north to west, encompassing 1,202 square miles.

(B) Population and Households.

The settlement of Chinese has gradually reduced the number of the Mongolian inhabitants, it is said, now to only about one quarter of the population.

As regards the households and population in the Prefecture, no accurate data are obtainable, but according to the latest police census, the total households numbered 17,836, and the total population 105,563. The births and deaths for a recent one year were 1,650 and 259 respectively.

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Divided into the sections, the above totals are distributed as follow:—

	Section 1 Town of Taonan	Section 2 Chahan-tala	Section 3 Haolipu	Section 4 Hsiao-Lao-yehmiao	Section 5 Wafang	Section 6 Hsi-Tachia-tzu	Total
Households	3,854	3,264	2,729	2,683	2,844	2,462	17,836
Total population ...	26,149	16,664	18,809	14,178	16,517	13,246	105,563
Male	18,132	9,212	10,658	12,562	8,597	7,705	66,865
Female...	8,018	7,454	8,151	1,616	7,920	5,543	38,702
School children ...	2,367	1,458	2,289	1,490	1,140	1,489	10,234
Able-bodied men ...	11,893	3,896	1,467	2,254	1,479	1,157	22,146

(C) Town of Taonan.

There was a time when the overflows of the River Taoerh, the invasion of Mongolian insurgents, etc., were heavy blows to this Town. In recent years, the Town has been growing slowly, but steadily, and the northern half is densely populated, there being a cluster of houses even outside North Gate. In the southern half, however, there are still patches of bare waste land.

In the northern half, the streets are lined with shops of various kinds. The houses consist mostly of flat, earthen-roofed description, but the leading business firms, Government offices, etc., are in fine tile roofed brick edifices.

The roads are, however, sadly neglected and have no drainage or sprinkling equipments. Therefore, a dust nuisance is present with great frequency, and the rainy weather will readily turn the roads into bogs.

The leading shops deal in sundries, cereals, furs and skins, etc. There are middlemen in cattle, shumshu distilleries, bean mills, etc., in addition to restaurants, hotels, bath houses, barber-shops, theatres, etc.

The census taken by the Chinese authorities gives the following:—

Population: 26,149
Households: 3,854

(D) Government Offices, Schools, etc.

There are in the Town the headquarters of the Twenty-Ninth Division and the Fifty-Eighth Brigade, the Prefectural Government Office, the police station, the district court, the tax collectors' office, the land reclamation office, the land tax collecting office, the post office, the telegraph office, the commercial, agricultural,

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and educational guilds, the educational office, the military hospital, different schools, etc.

1. The Prefectural Office lies under control of the Taoyin of Taochang (District Superintendent of Taochang) and looks after administrative and judicial affairs of the Prefecture.

2. The Police System. The Police district is divided into six sections, each section having its quotas of foot and mounted policemen.

The entire system is looked over by the Central Police Office, at Taonan, and is organized as under:—

	Locations	Officers	Clerks	Corporals	Men	Branch Stations	Police-boxes
Central Police Office	Within walls of Taonan	1 Superintendent 1 Asst. Superintendent 1 Inspector	1 Chief clerk 1 Clerk	2	Mounted 20 Foot 10	—	—
Section 1	Within walls of Taonan	2 Inspectors 1 Sergeant	1 „	12	Mounted Foot	80	2	11
Section 2	Chahantala	1 Sergeant	1 „	1	Mounted 10 Foot 2	1	—
Section 3	Haolipu	1 „	1 „	2	Mounted 15 Foot 2	1	1
Section 4	Hsiao-Laoyeh-miao	1 „	1 „	1	Mounted 10 Foot 2	1	—
Section 5	Wafang	1 „	1 „	1	Mounted 10 Foot 2	1	—
Section 6	Hsitachiatzu	1 „	1 „	1	Mounted 10 Foot 2	1	—

Remarks: At each police station there are the home for invalids, the sanitary union, the police-training institute, the home for victims of narcotic drugs, and the detention house.

3. Taonan Tax Collectors' Office. (3rd class office). It is divided into correspondence, accounting, tax-collecting, and auditing sections.

The tax-collecting area includes the seven prefectures of Taonan, Tuchuan, Ankuang, Chentung, Kaitung, Taoan, and Chanyu. Branch offices are kept in Kaitung, Ankuang, and Chanyu Prefectures, and sub-offices at Tuchuan, Chentung, Chienan, Taoan, Wafang, etc.

4. Land Tax Collecting Office is under control of the Prefect. He is helped by an assistant official sent by the prince of Chasakotu.

It is located on the premises of the Prefectural Office.

5. Land Reclamation Office. On July 1, 1919, the Fengtien Provincial Government at Mukden sent Mr. Li-hsuehshih (Superintendent) and Mr. Wangi-

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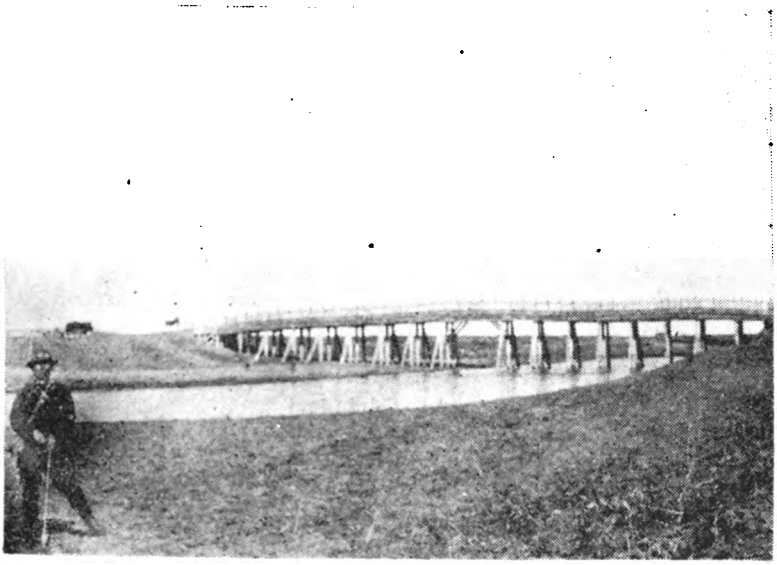
hsien (Assistant Superintendent) and they opened the central office in Taonan. Branch offices were also opened.



BRIDGE OVER THE TAOERH RIVER ON TAONAN-TSITSIHAR ROAD.

Their business is to attend to matters concerning the sale of waste land in the three principalities of Chasakotu, Tushihyehtu, and Sukung. (Details are given later).

6. Schools consist of one Higher Elementary School, two national schools, two girls' national schools, eight modern private schools, (under Government recognition), and twelve private schools.

There is only one Higher Elementary School (including the First National School) in the whole Prefecture. The teatchers' staff comprises 15 teachers and 1 secretary. It has 270 names on the school roll. Lessons are given on modern lines, inclusive of handicraft, English, and military drill. The school is reaping a creditable showing.

The Second National School has one teacher with 40 pupils; the two girls' national schools have between them five teachers and 120 pupils; the modern and ordinary private schools have each pupils ranging from ten to twenty in number under one or two teachers. The pupils vary widely in age, and are taught in the old stereotyped fashion.

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There is another school outside the walls of Taonan, and also at Chahantala, Haolipu, Hsiao-Laoyehmiao, Wafang, and Hsi-Tachiatzu. There is a school with 20 to 30 pupils under one or two teachers.

Nothing definite can be known as regards the rest of the Prefecture.

7. Religion. Christianity or a Christian church or preaching station is a thing unknown. Within the walls of Taonan, Chinese Buddhists are found in the largest number, and are followed by Mohammedans and Lamaists.

The walled town of Taonan has a temple dedicated to the memory of the great General Kuan-yu with six priests, in addition to another temple called the Chingshenssu (Pure True Temple) having two Mohammedan priests.

II. Communications.

(A) Cartage.

	In summer	In winter
For imports from		
Chengchiatun Sundries (120 *kin* per pkg.)	S.¥1.20—S.¥4 50	80 sen
Petune ,,	S.¥2.00	S.¥1.20
Tsitsihar, or sundries from Taonan to Tsitsihar	S.¥3.00	S.¥2.00
For Cereals to		
Chengchiatun	S.¥9.00 per *koku*	S.¥6.50
Petune	8 co ,,	6.00
Tsitsihar, or sundries to Taonan from Tsitsihar	10.00 ,,	7.50

Remarks: There are within the walls of Taonan 28 cart forwarding agents.

The Taoerh River has too little water and too many bends to be of any good for junk traffic. But, by about the end of October, the river gets frozen over and permits of cart traffic over the ice surface.

(B) Post and Telegraph.

1. Postal routes:

It takes two days for the couriers to carry mails to Ankuang; two days to Chentung via Taoanhsien; three days to Tuchuan; four days to Chengchiatun; three or four days to Chan-yu ordinarily via Pienchao of Kaitung Prefecture.

2. Telegraph charges:

	Per 10 Chinese characters	Per ten Roman letters
To a point in Manchuria ...	60 sen in large dollars	90 sen in large dollars
To a point outside Manchuria.	S.¥1.20 ,,	S.¥1.80 ,,
To Japan	S.¥2.50 ,,	S.¥2.50 ,,

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Messages for an address in a foreign country other than Japan are few and far between, and on this account, the tariff is not given.

III. Trade.

(A) Trade Houses.

Within the walls of Taonan, there are altogether 950 shops and stores (including 22 such as have capital of over S.¥30,000; more than 200 which have capital of over S.¥10,000; over 200 that have more than S.¥1,000 for capital; and the others numbering over 430).

a. Shumshu distilleries :—

	Manager's name	Capital
Hsiehchi	Li-holing	S.¥25,000
Yuchenching	Liu-shutang	35,000
Tehsingho	Liu-kiangyeh	50,000

b. Bean mills :—

Yuchenching	Liu-shutang	25,000
Kuangyuanching	Puchunnien	30,000
Fuhohsing	Chen-wu	10,000

c. Dry goods :—

Henglaiyuan	Tien-chuchu	15,000
Fushunhsing	Chang-wukuei	30,000
Techenghao	Liu	25,000
Yungchuhsiang	Wangyutung	20,000
Yuhsingyung	Kao-chentung	20,000
Chingtaihsing	Li-hsiangfu	20,000

d. General Stores :—

Chinshenghao	Li-laofeng	12,000
Yifatai	Cheng	7,000
Hsinhuikung	Wang	6,000

e. Produce Dealers :—

Yitsenghsing	Feng-huiting	7,000
Hsinhohhsing	Tsao-tienchung	5,000

f. Pawnshops :—

Kungyutang; Fuhotang; Yunghotang; Hsiangfatang; etc.

g. Exchange brokers :—

Yunghosheng; Tehsingchu; Hsinchi; Savings bank.

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h. In addition, there are 11 tailors, 5 dyers, 40 flour mills, 20 fur-dealers, 10 barbers, 9 haberdasheries (on a small scale), 20 photographers, 15 skin-dealers, 8 wood-workers, 10 rug-dealers, 26 blacksmiths, and 18 harness-makers.

All retailers' shops, chop-houses, etc., put together, the total number of the shops is put at about 1,000.

(B) Commercial Guild.

The Commercial Guild, Taonan, was founded in the 29th year of Kwanghsu (1903) and has twenty-four members, from among whom Chairman and Vice-Chairman are co-opted. As everywhere else, the Guild aims at quickening the local trade, maintaining a good mutual understanding among the members, and fixing the standard prices of all commodities. It is the central axis of the local trade organism.

FLOWERY PLAIN ON THE TAOERH RIVER OUTSIDE WALLS OF TAONAN.

Fees are collected according to the classification of the members on the bases of the working capital at command, profit, etc. The total monthly fee is not less than ¥1,100, The Guild also collects the taxes on behalf of the Government.

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The annual expenses of the Guild are put at about ¥10,000, out of which the repairing, etc., of the bridge over the Taonan River, the fire-brigade expenses, the upkeep of the Guild itself, etc., are paid.

The Guild further serves as advisory board to the Prefect.

IV. Agriculture and Stock Farming.

(A) Arable Area and Farmers.

As previously hinted, the original area of Taonan Prefecture was partially included in Chanyu Prefecture and also Tuchuan Prefecture, when the southern half of Tuchuan Prefecture was detached to form the substance of a new Prefecture under the style of Chanyu.

The existing area of the Prefecture is as follews :—

Fine land Medium land Poor land	4,615 *fang* 3,800 „	consisting of 1,610 *fang* under cultivation & 3,005 *fang* not under cultivation.
inclusive of 2,400 *fang* expected to revert to waste land		
Total	8,415 *fang*	

Remark : 1 *fang* consists of 45 *hsiang*, each *hsiang* being equivalent to 1860 *tsubo* (Japanese).

The following table gives the number of farming households, land under cultivation and otherwise, etc. :—

	Number of Farming households	Under cultivation: Farm land hsiang	Under cultivation: Vegetable gardens hsiang	Not under cultivation: Land reclaimable hsiang	Not under cultivation: Wasteland hsiang
Section 1	2,178	6,000	1,200	27,783.5	
2	1,332	15,000	800	15,399.7	
3	1,740	10,500	450	28,587.0	3,800 *fang*
4	1,560	10,800	600	43,175.8	
5	1,146	13,800	900	42,093.6	
6	1,116	12,000	400	28,199.8	
	9,072	68,100 or 1,513 *fang*	4,350 or 96 *fang*	185,240 hsiang	171,000 hsiang
		12,450 hsiang or 1,610 *fang*, of which the area under actual cultivation is estimated to be about 80%, making allowances for the crop rotation and fallow.		356,240 hsiang	

Remark : The number of the farming households given above have no connection with the police census mentioned in the preceding Chapter.

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	Horses heads	Cattle heads	Mules & donkeys heads	Sheep heads
Section 1	1,500	650	150	550
2	1,200	2,000	100	200
3	1,300	1,500	130	400
4	1,500	1,800	120	500
5	1,700	1,400	200	700
6	1,100	1,300	190	800
Total	8,300	8,650	890	3,150

	Hogs	Chickens	Ducks	Geese
Section 1	1,500	5,100	230	50
2	1,700	5,500	210	61
3	1,500	4,200	220	20
4	1,600	3,800	190	60
5	1,900	3,500	170	40
6	1,300	3,200	160	35
Total	9,500	25,300	1,180	266

The police returns give quite another tale and say that the total numbers of horses, cattle, and sheep in the whole of the Prefecture are 34,000 heads, 25,000 heads, and 36,000 heads respectively.

(C) Waste Land in Three Prefectures.

Open to Sale.

(1) The locations and areas of waste land open for auction sale in the three principalities of Chasakotu, Tushihyehtu, and Sukung are as under:—

a)	About Taipenchan in Chasakotu principality at 27 miles north of Taonan	24 *fang*	20 *hsiang*
b)	In the Kueiliu River Valley tn Chasakotu principality at 93 miles northwest of Taonan	20 *fang*	
c)	About Wangyehmiao in Tushihyehtu principality at 63 miles west of Taonan	1,200 *fang*	
	Total	1,244 *fang*	20 *hsiang*

(2) Prices (as fixed at the time when the auction sale was commenced):—

	per *hsiang*	per *fang*
Class A	4 taels 4 maces	S.¥249.48 in Chinese small silver coins
B	2 „ 4 „	97.20 „
C	1 „ 4 „	39.69 „

Remarks:—1 tael is equivalent to S.¥1.50 in large dollars and S.¥1.80 in Chinese small silver coins.

The Area unit for sale is 1 *fang*.

An area of 1 *fang* (consisting of 45 *hsiang*) is handed over to an approved buyer of land open for sale, provided the prices for 31.5 *hsiang* for Class A, 22.5 *hsiang* for Class B, and 15.75 *hsiang* for Class C are paid.

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(3) Applicants for the purchase of land will be handed a provisional title deed as the land in question has been duly surveyed.

At an appointed date, an official title deed will be issued in exchange for the provisional one.

For the issue of an official title deed, 1 tael is charged as fee irrespective of the classes of land.

(4) No special time is named for the sale of land.

(5) The land open for sale is quite fertile. Apricots, reeds, motherwort, etc. grow in profusion. Most of it may be reclaimed into excellent farmland. Especially, the land along the Kueiliu River is black soil well suited to extensive farming. In this valley and neighbouring districts, elms, willows, etc. are found in good numbers. They seem to thrive and grow rather fast, suggesting the adaptability of the same region to afforestation.

TOWN OF TAONAN.

The belt near Taipenchan and Wangyehmiao is somewhat inferior in the degree of fecundity to the Kueiliu Valley, nonetheless they are good for raising buckwheat, hemp, maize, etc. Places where dunes are found appear to make splendid grazing grounds for cattle, horses, and sheep.

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Besides, in 1917, the Provincial Government of Heilungkiang offered for sale 2,200 *fang* of waste land at the foot of Solun Mountain and 1500 *fang* more at Tulachi, but through the interruption of the Mongolian insurgents who rebelled in strong force, the sale ended in failure.

However, as the Provincial Government of Fengtien founded the Reclamation Office at Taonan in July, 1919, to attend to the business connected with the waste land sold in the three Mongolian principalities as above mentioned, Heilungkiang Province also opened a branch reclamation office within the walls of Taonan. But both Solunshan and Talachi being from 100 to 130 miles distant from Taonan and being known to be only inadequately patrolled, those applying for purchase of land in those localities are said to be but few.

4) Land Prices.

Within Walls of Taonan.

Land of	per *hsiang*	Land of	per *hsiang*
Superior class	S.¥2,000	3rd class	Over S.¥500
1st „	1,200–1,600	4th „	„ 350
2nd „	Over 800	5th „	„ 80

Near Town of Taonan.

Farmland.

Farmland from S.¥60 to S.¥200 per *hsiang*
Vegetable Gardens from S.¥200 to S.¥400 per *hsiang*
Waste land { Fine land from S.¥600 to S.¥800 per *fang*
Medium land from S.¥250 to S.¥600 „
Poor land from S.¥150 to S.¥250 „

As one leaves Kaitung Prefecture, in which the soil is comparatively sterile, and gets into Taonan Prefecture, proceeding towards the town of Taonan, one will see the land better adapted to cultivation.

Especially, in the valley of the Nachin River north of the Chiaoliu River, the soil is the most fertile, and compares well even with the left bank of the Taoerh River in Taoan Prefecture. Reclamation work is progressing gradually. Naturally the new settlers are attracted to the more fecund portion of land, and few are tilling poor land.

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The following is a rough review of the cultivation areas with the harvests in Taonan Prefecture :—

	Percentage of cultivation	Harvest per *hsiang*	Remarks
Kaoliang	40%	2.5 *koku*	1 *koku* corresponds
Beans	12%	2.0 „	to 2.1 Japanese
Millet	10%	3.0 „	*koku*
Wheat	6%	3.0 „	
Maize	6%	3.0 „	
Hemp-seed	4%	1.5 „	
Melon-seed	4%	2.0 „	
Sesanum	2%	1.0 „	
Buckwheat	2%	2.0 „	
Pulse, Beans being excepted...	5%	1.5 to 2.0 *koku*	
Others	9%	—	

Remarks: The district north of the River is more productive than that south of the River. The above table gives the average yield, and has been prepared on the basis of the returns obtained from the Chinese authorities.

The Mongolians do not take kindly, as a rule, to kaoliang or Beans, but are more partial to millet, wheat, maize, melons, etc. As to the Chinese settlers, they seem to prefer kaoliang and Beans above all else, and as for the rest, they will grow such as are suited to the soil best.

The following is a table of comparison of both the agricultural products and the lands under cultivation of the five Prefectures lying within the trade zone of Taonan :—

Prefecture	Agricultural products	Area under cultivation.
Taonan	124,600 *koku*	42,833 *hsiang*
Taoan	135,398 „	37,251 „
Ankuang	61,655 „	25,118 „
Chentung	43,692 „	20,635 „
Tuchuan	35,500 „	14,200 „
Total	400,845 „	140,038 „

The crops for 1918 came out generally plentiful, and with a little of the adjoining districts added, the total harvest is put at over 600,000 *koku*. But, those for 1919 proved a failure, yielding only 400,000 *koku* as in the above table.

From the above table, the average crop of about 2.85 *kok u* per hsiang is obtained.

Supposing that the same average should be accepted with safety for the average returns per *hsiang* for all the five Prefectures, above mentioned, and further assuming

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that all the arablel and of the five Prefectures amounting to about 900,000 *hsiang* or 20,000 fang should have been placed under cultivation, the aggregate annual harvest would reach about 2,565,000 *koku* or some 5,386,500 *koku* by the Japanese measure.

How soon the whole of the arable land may be reclaimed and what may be the annual surplus stocks of cereals and kindred produce may be said to depend in a large measure upon at what pace the population and the land reclaimed will increase on the completion of the Ssupingkai-Taonan Railway now undergoing an extension beyond Chengchiatun.

The produce returns rendered by the Chinese authorities for 1919 are as under :—

Taonan Prefecture.

	Land under cultivation *mou*	Harvest *koku*	Harvest per mou *koku*
Kaoliang	200,000	50,000	0.25
Wheat	30,000	9,000	0.30
Buckwheat	10,000	2,000	0.20
Beans	50,000	10,000	0.20
Red beans	10,000	2,000	0.20
Peas	20,000	300	0.15
Green beans	10,000	2,000	0.20
Cock's shin	10,000	3,000	0.30
Italian millet	50,000	15,000	0.30
Maize	30,000	9,000	0.30
Sesamum	10 000	10,000	0.10
Hemp-seed	22,000	4,050	0.10
Melon seed	20,000	2,000	0.20
Total	472,000	127,350	

Taoan Prefecture.

Wheat	8,953	2,238	0.25
Buckwheat	7,947	2,384	0.30
Beans	14,690	2,938	0.20
Red beans	6,230	2,246	0.20
Peas	2,291	458	0.20
Green beans	7 857	1,571	0.20
Cock's shin	82,728	29,304	0.35
Millet	112,752	39,463	0.35
Maize	94,620	28,386	0.30
Kaoliang	164,501	49,350	0.30
Sesamum	2,928	282	0.10
Total	505,497	158,623	

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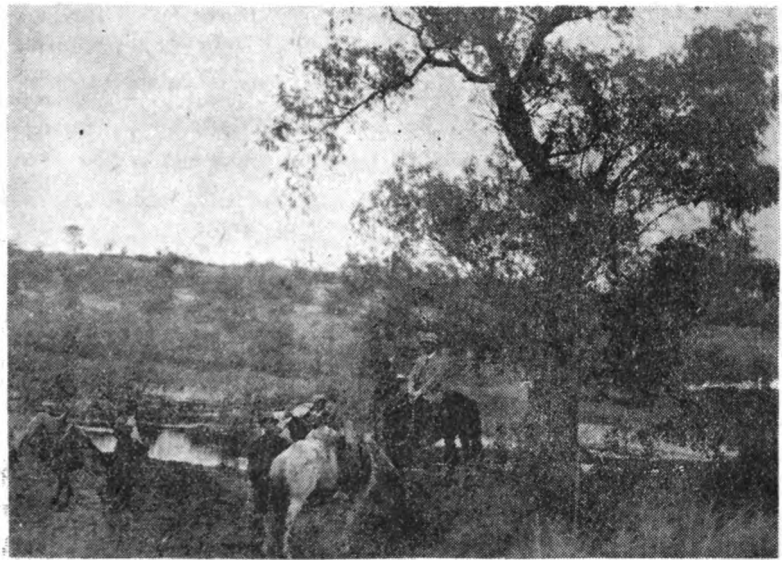

NEAR WUCHIATZU ON THE PROPOSED CHENGCHIATUN-TAONAN LINE.

Ankuang Prefecture.

	Land under cultivation	Harvest	Harvest per mou
	mou	*koku*	*koku*
Buckwheat...	3,500	420	0.12
Wheat	2,000	600	0.20
Maize...	112,400	33,720	0.30
Kaoliang	85,700	25,710	0.30
Italian millet	32,000	640	0.20
Millet...	27,500	550	0.20
Cock's shin	28,200	846	0.30
Beans...	8,200	205	0.25
Total	374,300	62,691	

Chentung Prefecture.

Wheat	6,535	1,507	0.20
Buckwheat...	4,652	1,628	0.30
Beans...	7,619	1,523	0.20
Red beans	2,952	591	0.20
Peas	2,331	466	0.20
Green beans	1,583	316	0.20

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	Land under cultivation *mou*	Harvest *koku*	Harvest per mou *koku*
Cock's shin	22,078	7,727	0.35
Italian millet	27,725	9,704	0.35
Maize...	15,651	4,668	0.30
Kaoliang	45,015	13,504	0.30
Sesamum	928	98	0.10
Total	137,123	41,532	

Tuchuan Prefecture.

Barley	4,500	675	0.15
Wheat	12,000	1,320	0.11
Buckwheat...	6,600	60	0.01
Beans...	3,500	350	0.09
Red beans...	1,400	84	0.06
Green beans	600	30	0.05
Cock's shin	8,500	850	0.10
Italian millet	11,500	1,725	0.15
Millet...	9,300	1,395	0.15
Maize...	15,000	1,800	0.12
Kaoliang	29,400	1,470	0.05
Potatoes	1,700	1,700	1.00
Total	103,400	11,459	

Remark: 1 koku is equivalent to Japanese 2.1 koku; 1 *mou* (186 *tsubo*).

CURRENT NEWS.

Plagne Prevention Campaign.

In South Manchuria, 1921.

The plague epidemic tolls in Manchuria during nearly nine months from September, 1920 nearly 8,000 deaths, comprising only such as were officially bulletined. The efficient prevention system, which delivered South Manchuria, and the adjoining districts from the deadly clutch of the dread scourge, was dissolved on June 15, 1921, after the strenuous work of nearly half year.

Apart from the newspaper reports given fragmentally on the subject of anti-

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plague campaign, a brief connected review thereof may be of some interest, since it will incidentally show the benefit of the ceaseless progress of science.

Sporadic cases of bubonic plague appeared at points in North Manchuria from autumn, 1920. The epidemic assumed the symptoms of the pneumonic plague towards the end of last year. It advanced eastward like wild fire from Manchouli to Jalai Nor, Hailar, Tsitsihar, and Harbin. As the medical specialists watched the rapid progress of the pestilence, they could not help recollecting the untold horrors of the great plague epidemic in 1910-1911. They were determined to minimize the havoc of the terrible death-dealer at all cost for the sake of the welfare of humanity.

The Japanese authorities concerned formulated many plans of campaign, but had to grapple with the obstacles lying in the way, arising from the necessity of international cooperation.

They decided at last to organize with the highest skill and ability available the foremost line of prevention on the line of Changchun (the northern terminus of the South Manchuria Railway). By dint of this effort, the southward advance of the epidemic could be successfully checked, in contrast with the awful fact that some 4,000 victims were claimed about Harbin, where the smoke rising from the bodies under cremtaion was seen trailing on the breeze from day to day.

In the South Manchuria Railway Area one case broke out at each of Kungchuling and Mukden. These, together with the others that were caught up in the prevention net work about Changchun, maintained conjointly by Japanese and Chinese physicians, etc., numbered only 94. The grand total of the cases discovered south of Yaomen on the Harbin-Kwanchengtzu Section of the Chinese Eastern Railway, where, it might be said, our prevention outpost was kept, was no fewer than 153.

The majority of them, however, were traced to have got infected at Harbin or elsewhere in North Manchuria. It deserves congratulation that the deadly scourge was kept off South Manchuria, save for the few stray cases.

The effective campaign was of course due in a measure to mastery of science which instituted and maintained it, but, in a larger measure, to the sincere cooperation of the Japanese and Chinese authorities concerned.

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Especially, Taoyin Tsai, at Changchun, was heard saying that there was no territorial boundary when it concerned diseases. He knew that, in order to safeguard the hygienic welfare of South Manchuria and the other adjacent district, both the Kwantung Government and the South Manchuria Railway Company, which are both equipped with the necessary institutions and invested with special authority, ought to be consulted and cooperated with.

Thus, his view coincided with that of the Japanese side.

On February 12, 1921, about forty Japanese and Chinese representatives met at the first joint conference at the Japanese Consulate, Changchun. The fundamental principles of the campaign were then outlined. They came together whenever there was occasion for it and opinions were exchanged without reserve. Especially the medical staffs of both sides worked hand in glove.

The progress of the campaign was as follows:—

(1) Detention of South Bound Low Class People.

Hitherto, the low class people, especially Chinese coolies, were regarded as the most dangerous medium. Therefore, these people had to be dealt with adequately, first of all. So, all low class people coming south from the infected district had to be detained for the incubation period (five days), in order to see if they were infected. And, a restriction was enforced with the 3rd and 4th class railway travellers by the Harbin-Kwanchengtzu Section, and further they were put under the stipulated detention on arrival at Changchun.

This detention was opened on February 17, and was stopped on June 5, 1921. The detention houses were located at both Changchun and Kwanchengtzu.

Those at Changchun belonged to the Japanese side and consisted of two, capable of accommodating about 1,300 inmates. The others at Kwanchengtzu consisted of nine houses, with the total accommodating capacity of about 1,000 people. In addition, two more, holding 300 people, were opened inside the walled city of Changchun.

Each detention house contained a kitchen, an office, a medical office, and a sick ward. The inmates were fed free of charge and were carefully looked after by the resident physician. In order to preclude misunderstanding on the part of the inmates, both sides detailed police officers to look over them jointly.

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The total inmates numbered over 7,000 at Changchun, and over 6,500 both at Kwanchengtzu and within the walls of Changchun. Out of these, 39 cases of plague appeared.

(2) Detention of Foot-travellers, etc.

In response to the Japanese proposal, the Chinese Eastern Railway restricted the daily issue of 3rd class railway tickets at Harbin. As a result, some were hidden in a goods car; others footed it all the way into South Manchuria; a few got off the train one or two stations before reaching Changchun. Accordingly, no passenger was allowed to break journey at a station south of Yaomen Quarantine stations were opened at Yaomen, Mishatzu, Tapingshan, Erhshihlipu, Kalun, and Chiutai. The one at Yaomen was best staffed and equipped. It had two detention houses with sick wards. The medical and other staffs were composed of Japanese and Chinese. Special pains was exercised over the quarantine on train.

Consequently, foot-travellers decreased in number, only a very small number of coolies evading the quarantine.

From the two detention houses at Yaomen, 13 cases of plague were discovered.

(3) Restrictions on South Manchuria Railway.

In order to prevent the southward journey of the coolies who evaded the quarantine, the low class people intending to entrain at any station between Changchun and Mukden were required to present a certificate issued by either Japanese or Chinese authorities, showing that the holder had stopped more than five days at that place, and none but such as presented the certificate could procure a railway ticket. Moreover, there was a quarantine conductor on duty on every train to see if there was any who had not conformed to the arrangements in force. Any offender, if found, was sent back to Changchun for the five days' detention.

(4) Improvised Hospitals Put Up.

Improvised hospitals were hurriedly put up on the Chinese Eastern Railway between Changchun and Kwanchengtzu by the Japanese side, and at about 250 metres from the Japanese hospital also along the same Railway. Goods cars were converted into sick wards. Each car contained two beds. Light and heating were also provided as circumstances permitted For lighting purposes at night,

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electric light wires were laid as extensions from Changchun. Altogether eleven goods cars were pressed into service. The medical staff consisted of Japanese experts and Chinese specialists who had graduated from the South Manchuria Medical College. Nurses were recruited from among the Chinese male nurses in the service of the South Manchuria Railway Hospital. This was done to overcome the difficulties resulting from the difference in language, customs, and habits. However, to our regret, not a promise was given by any of the cases for an ultimate recovery.

(5) Bacteriological Laboratories Erected.

For ensuring a quick examination, a bacteriological laboratory of improviss pattern was erected by the Japanese in the Railway Town of Changchun, and also by the Chinese inside the walled city of Changchun.

The Japanese laboratory conducted tests by two bacteriologists, who had had years of experience at the Kitazato Bacteriological Institute, under the leadership of Dr. M. Tsurumi, an authority on bacteriology. The Chinese laboratory was managed by an able specialist of the Central Prevention Office, Peking. Besides the tests necessary for the plague prevention, scientific researches, too, were prosecuted at these laboratories.

(6) Quarantine on Train.

The quarantine inspection on train, which formed an important factor of the campaign, was conducted on the Southern Section of the Chinese Eastern Railway and the South Manchuria Railway Main Line from January 29 to June 15, 1921. The quarantine section of the Chinese Eastern Railway was principally the short span between Kwanchengtzu and Changchun. Japanese and Chinese medical and police officers officiated. They discovered four plague cases.

Other matters deemed necessary were also enforced.

The items that are held as the most efficacious were (1) Detention of south bound low class people and (2) Interception of foot travellers, etc.

Experience teaches that, in the case of the plague, especially, it was the import of only a few cases that, like a few live embers falling on inflammables, spread destruction broadcast, defying at least for a time all efforts to control the catastrophe.

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The joint prevention net caught fifty-two infected people. In other words, the attempt to run the quarantine blockade between North and South Manchuria was repeated fifty-two times, but nothing approaching an epidemic ensued in South Manchuria. This was only because most of the cases were developed into an infectious stage after being placed in the detention houses.

Thus, South Manchuria and the adjacent territory were preserved plague-free, and the scourge was exterminated in quick order.

This exploit could be achieved through the joint sincere cooperation of the Japanese and Chinese sides, of which a hearty appreciation ought not to be grudged them who waged the campaign with so consummate a thoroughness.

The total expenses laid out for the campaign reached about ¥400,000 by both Kwantung Government and South Manchuria Railway Company put together. What the Chinese outlay was is, however, unascertainable.

The above illustrates eloquently how much can be done by the international cooperation complemented with the wonders of the advanced medical science, in a life and death combat with the most terrible form of all pestilences, so as to save numerous lives and immense cost that would otherwise have been lost.

It is to be devoutly hoped that this spirit of hearty cooperation will actuate and sustain other enterprises of no less importance to the Japanese and the Chinese, that is, in political, economic, and social lines.

MANCHURIA ENLIGHTENING SOCIETY.

Whose Organ the "Light of Manchuria" is.

What actuates us in our endeavours to open up Manchuria and Mongolia lies in realizing our ultimate ideal in the enlightenment and development of Manchuria and Mongolia. It will not do only to develop the natural and industrial resources, but the ethical and intellectual culture of the inhabitants must also be carefully husbanded and nourished, so that both mind and matter may be developed in harmony.

The Manchuria Enlightening Society raised its first cry in order to fill a sorely felt need. Its primary mission is to investigate and propagate the truths of the development of Manchuria and Mongolia. We shall studiously refrain from misleading the public by disseminating inaccurate or exaggerated reports, but shall steadfastly adhere to the truth or facts only.

It is urgently important that the truths regarding Manchuria and Mongolia should be made known clearly not only to Japan and China, but

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also to Europe and America. On this account, the establishment of the Manchuria Enlightening Society is bound to have a serious significance of international character.

If happily, through the establishment and activity of this Society, the truths of the development of Manchuria and Mongolia should become topics of world wide interest, it would not be only an honour to those now actively engaged in developing these regions, but also a matter of congratulation to the world at large.

We might be permitted to add that the ultimate ideal and desire of this Society are to serve as the herald of all enlightening movements in future, thereby opening a new chapter in the annals of the world's civilization.

What is the Society Like.

a) Office.—The office of the Society is in the Municipal Office Building on Central Circle in the city of Dairen.

b) Society's Work.—The works of the Society include the following:—

1. Publication of the organ of the Society, The "Light of Manchuria."

2. Supply of general information through the Socitey and by other means, giving the results of such investigations and researches as may be conducted in the interest of the development of natural, industrial, and other resources in Manchuria, Mongolia, and Eastern Siberia.

3. To act as guide to intending investors in general in all kinds of enterprises in Manchuria, etc., and also to undertake any special investigation or research on application by promoters of all kinds.

4. To offer facility to travellers on inspecting visits to Manchuria, Mongolia, Siberia, Chosen (Korea), China, etc., to the end of importing accurate information and rendering their observations as close to truth as possible.

5. To use all kinds of means in order to propagate the true conditions obtaining in Manchuria, etc., and further to carry on the propaganda work for these regions through the medium of lecture meetings, exhibitions, etc.

6. To compile, publish, sell, and distribute books, pamphlets, etc., bearing on Manchuria and Eastern Siberia.

7. To carry on other works necessary for disseminating information on Manchuria, etc., and also for fostering economic enterprises therein.

c) In carrying on the above work, the Society is divided into the following:—

Secretariate,
Research Department,
Publication Department,
Intelligence Department, and
Accounting Department.

d) Any one wishing to join the Society is requested to send in a written application, giving the name and address, accompanied with the membership fee for not less than three months paid in advance.

e) The membership fee, entitling the member to a copy of the monthly organ, costs 50 sen (½ yen) per month and ¥6 per annum.

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All remittances to this Society may be made most conveniently and safely to Transfer Savings No. 2850, Dairen. No receipts for the same will be issued, but instead the Society's monthly organ will be sent.

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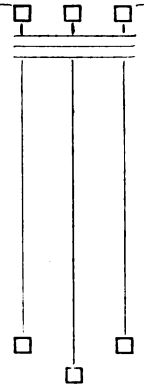

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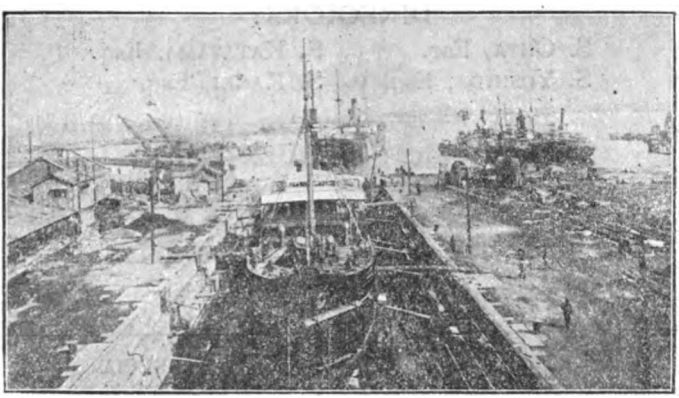

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THE
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POSSIBILITY OF MANUFACTURING POTASSIUM

From Kaoliang Ashes in South Manchuria.

By Mr. Y. Sato.

INTRODUCTION.

Kalium or potassium is used not only in conjunction with such important materials in chemical industry as saltpetre, potassium cyanide, potassium sulphate potassium bichrorate, potassium chlomate, etc., but also as indispensable material for potassic fertilizers constituted of nitrogen, phosphoric acid, and potassium.

Before the great War, potassic industry had practically exclusively been carried on by Germany, and the other countries looked to her for supply. Since the outbreak of the War, the import of potassium salts having been stopped absolutely, the Allied Powers soon suffered from dearth thereof and proceeded at once to try to supply their own wants.

In Japan, too, the stoppage of the import of German potassium caused a panic among the dealers concerned. As to ordinary chemical-industrial materials, they could be imported from Great Britain, the United States, or France in more or less quantity, and their prices were brought nearer the normal levels. However, with such dye-stuffs and potassium salts as were produced exclusively in Germany, they ascended steadily in price to the untold distress of their consumers. Shortage of potassium chlorate (necessary for the manufacture of matches), chili-saltpetre (as raw material for making explosives), potassium cyanide (required in assaying gold), potassium bichromate (as dyeing medium), potassium sulphate (as fertilizer) produced a very serious effect upon the industrial Japan.

It was under such circumstances that both Government and people bent their energies upon the quest of sources of supply and the study of some workable method of manufacturing them.

In 1915, the Industrial Laboratory, Tokyo, took the initiative in starting practical investigations and subjected a variety of likely materials to scientific tests. Specialists other than in the Government service also took up a similar study one after another. And potassium factories on modest scales began to come into being. These efforts were not without a reward. By 1917, 1300 tons of potassium salts and 9,000 tons more of the same could be obtained from bittern and kelp, to meet

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the burning need. Subsequently, the production of potassium chlorate, for instance, exceeded the demand, and could be exported to the United States, etc.

It was at this juncture, too, that the manufacture of potassiumsalts from kaoliang stalk ash was invented. Now that peace has been well restored, and the leading countries other than Germany have begun to supply their own needs in the matter of potassic substances, it seems certainly an interesting problem whether or not they can withstand the inevitable competition of the Germany that is bound to come, and can establish their longed-for independence in potassic supply.

Chapter I.

Potassic Industry During the War.

Supply and Demand.

Formerly potassium salt was made from ashes of wood and other botanic matter. In many cases, soda and potassium salts can be used interchangeably. In the Eighteenth Century potassium salt was principally used in manufacturing glass, soap, etc., sodium salts made out of natural soda having formed only part of the demand, for in those times potassium salt (chiefly potassium carbonate) was by far the cheaper article than sodium salts (chiefly carbonate of soda).

But, since the latter part of the Eighteenth Century, such industries as Cotton, glass, soap, etc., made a rapid advance, and ashes left after burning botanic matter fell far short of satisfying the quickly rising need. It might be readily understood that all the ashes available from the forestry resources of one country failed to fulfil her own growing wants. Incidentally, the freight rates from Canada, Russia, Italy, and other afforested countries raised the prices of the ashes, especially where rapid means of communications were more or less lacking.

Under such condition, the process of making soda from salt existing ubiquitously in an almost inexhaustible volume was thought out, and in 1778, what is known as the Le Blanc system of making artificial soda was announced, marking a new epoch in alkaline industry. Next, in 1860, Mr. Solvey invented the ammonia soda process, and gradually supplanted the out-dated Le Blanc system.

With the invention of the electrical solution in recent years, the artificially- and cheaply-made soda obtainable in any quantity has dominated the world, and

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together with the acid industry, has come to constitute the so called fundamental chemical industry.

Thus, the reign of potassium salts in old times has given way to that of artificially made soda.

However, soda cannot always serve as substitute for potassium. To cite an instance, as fertilizer for the plants, potassium is an absolute necessary and its place cannot be filled by soda. Again, as to nitrates, sodium nitrate is hygroscopic and is ill-suited to the manufacture of black powder; potassium nitrate must be used. Next, soda will not do as substitute for potassium chlorate. It is also generally known that potassium is indispensable in making chromates, permangamates, etc. Thus, the demand for potassium salts has rapidly increased.

In 1857, the potassium bed near Stassfurt (in North Germany) was discovered, and it has been mined more extensively year after year. At length, the potassium salts of North Germany came to dominate the potassium supply of the whole world.

We have stated above how vegetable ash used to be employed as material from which to obtain potassium salts. But any such undertaking would have never withstood the pressure of North German potassium on the market. Therefore, the use of vegetable ash has been given up since the latter part of the 19th Century.

In 1913, just prior to the outbreak of the War, the total output of potassium oxides in North Germany reached 1,140,000 tons, of which about half the amount was consumed domestically; 230,000 tons were exported to the United States; and the remainder was divided among Great Britain, France, Holland, Russia, Austria, Japan, etc.

The total outputs of North German potassium (K_2O) in Germany, with their estimated prices, were as under:—

	Outputs ton	Price mark	
1880	68,580	19,202,372	
1900	303,610	57,246,896	
1910	857,883	153,614,161	
1914	1,186,440	210,000,000	according to estimation of Mr. Tohyama (graduate of Agricultural College, Imperial University).
1920	800,000	222,480,000	

With the outbreak of the War, the supply of potassium was cut off, and, under the awful tension of the panic, which reigned in the chemical-industrial

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world, endless experiments in nearly all countries outside Germany were carried on to the end of supplying their own wants.

The United States, being the heaviest consumer of potassium salts prior to the War, felt the stoppage of supply worst, and, as regards both materials and methods of manufacture, she has conducted the most interesting investigations and experiments.

(2) Potassium Resources of the World.

The chief potassium resources of the world, which had been used before the War and have been discovered since the War, are as under:—

1. Potassium bed.
2. Water of natural salt lakes.
3. Bittern, a bye-product in salt manufacture.
4. Ash of vegetable matter.
   - (a) Ash given by burning wood.
   - (b) Ash „ „ „ sea-wood.
   - (c) Ash „ „ „ totacco stalks and stems.
   - (d) Ash „ „ „ residue left in sugar manufacture, sugar cane stalks, and beet.
   - (e) Ash „ „ „ molasses, and residue left after distillation of fermented molasses.
   - (f) Ash „ „ „ stalks and grass.
5. Cement Kiln dust.
6. Ash of blast furnace of iron and steel works.
7. Felspar, alum-ore, and other minerals.
8. Water left after washing wool.

(3) Potassium Beds.

(a) Germany's Monopoly of Potassium Supply before the War.

We have stated how Germany supplied nearly the whole of potassium salts of the world before the War. Her potassium beds lie near the Harz Mountains with Stassfurt as the centre of potassium industry.

In 1857, at a depth of 1,080 ft., a potassium bed was struck about 260 metres beneath a rock salt mine. At that time, the fertilizing virtue of potassium had not yet been fully appreciated, and the rock salt was the principal object exploited. Not long afterwards, the fertilizing property of potassium became clearly recognized, and a number of companies sprang up at Stassfurt and vicinity, and soon Brunswick, Honover, Mecklenburg, and Sulingen were encompassed within the sphere of the potassium industry.

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The mining of potassium salts was begun in 1862, and since the mining operation was prosecuted scientifically and economically. By 1907, the companies formed upon this line of industry numbered 39, which were reorganized into a syndicate. This is what has been known world-wide as the Potassium Syndicate which has practically monopolized the market. This Syndicate instituted a vigorous propaganda work for potassium after some years of endurance and disseminated the high virtues of potassium as manure among the agricultural classes, and it succeeded in reaping the signal success as the chemical industry became developed.

Before the War, the aggregate annual production of potassium salts ranged between 10,000,000 and 13,000,000 tons or between 900,000 and 1,100,000 tons in the form of potassium oxide. During the War, the total output was reduced to some 10,000,000 tons.

In 1920, the total production of potassium oxide reached 800,000 tons, of which 200,000 tons were for exportation. The price was 50% higher than before the War. The potassium resources of Germany may well be called inexhaustible, and are estimated to suffice to supply the whole world for 1,000 years or longer.

(b) Position of Alsace Potatssium Beds.

Alsace potassium bed is another that has been known since before the War, in addition to the potassium bed in North Germany.

It was discovered in 1904 and has been actually operated from about 1910. The whole potassium reserve is estimated to reach 3,000,000,000 tons in the form of potassium oxide. Before the War, this bed had lain under management of the Potassium Syndicate. The mining concession, price, etc., of this bed and its output, were left to the determination of the National Commission of Distribution. The maximum output amount was put at within about one-fifth of the aggregate output of Germany. In 1912, 140,000 tons were mined, and in 1913, 350,000 tons. A recent report says that the same mining zone extends across the Rhine as far as Baden. In fact, this same bed, together with the great iron mine in Lorraine, formed the richest treasure vault of Germany. By the Peace Treaty, the two beds have been restored to France, thereby shattering to pieces Germany's ambitious dream to acquire the preferential claim of the economic world.

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The bountiful resources of this potassium bed await human exploitation, and its contest for supremacy with the potassium bed of North Germany may be called a very interesting question to follow.

(c) Promising Catalonia Bed in Spain.

Not a few potassium beds were discovered and mined immediately before and after the outbreak of the great War. The best known is the one in Catalonia, which spreads over the two Provinces of Lerida and Barcelona. Soon after the discovery of this bed, a company under French-Spanish joint management, the Potassium Co. of North Germany, etc., each tried hard to secure the privilege of operating the mine, well aware of its promising character. They each scored a partial success in their effort. But the Spanish Government became no less awake to the serious importance of the enterprise and exerted itself to reserve the mine for its own tapping since the outbreak of the War by means of sundry restriction acts. In 1918, the Potassium Bed Act was promulgated, by which this particular line of mining has been placed under its own supervision, and thus the possible transfer of its management to an alien hand has been forestalled. This bespeaks in itself what a high value is set thereon. Some day, it will prove not so very unattainable as generally imagined to undermine the domination of German potassium.

(d) Italian Bed.

It is in Eritrea, an Italian colony on the Red Sea. The output for 1918 is reported to have reached 50,000 tons. The output is fine enough in quality, but, as the mineral reserve is supposed to be not so remarkably large, much cannot be expected. Most that may be safely expected thereof will be to fulfil Italy's own need.

(e) Other Beds.

There are other beds in other countries, but none of them can hold a candle to any above mentioned. For instance, the Kalusz bed in Galicia, which has long been known, fails to meet even the demand of Austria and Hungary.

The alunite bed in the State of Utah, U. S. A., gives only a modest output. Besides, the bed is too far from the railway to be turned to a practical account.

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Also, in addition to the strata of potassium chloride on the bank of the salt lake in Chili, the discovery of potassium beds have been reported from Peru, Russia, Holland, Sicily, etc., but none of them has yet got ready for tapping. Again, in India, Chili, Brazil, etc., potassium nitrate beds have been discovered, but all of them are said to be too limited in quantity to hold out any promise at all.

(4) Progress of American Potassium Industry.

The annual consumption of potassium salts, etc., in the United States of America before the great War was about 1,000,000 tons, which is equivalent to 250,000 tons of potassium oxide. For the supply of the above, Germany was depended upon almost entirely, and it formed quite half the whole of Germany's exports. 95% of the import to America was used for agricultural purposes. On this account, the United States was the party who felt the stoppage of the import of potassium from North Germany most keenly. In 1914, there was no stock of potassium in all the United States. And thus, the Government and people combined their efforts in the investigation of any potassium resources existing in the United States, the study of how to manufacture potassium, and also the establishment of potassium factories. So, the United States outwardly became the greatest centre of potassium study in the world in the war time, and a creditable showing was worked out.

The domestic production of potassium increased gradually. In 1915, the whole production of potassium oxide was only 1,000 tons. In 1918, the figure rose to 55,000 tons, and the producing capacity at the end of the year was estimated at 100,000 tons.

Potassium industry thus made remarkable headway in the United States.

For all this progress, the total domestic production was no more than 22% of the pre-War demand of the United States.

The following is a table of the potassium resources in the United States and the outputs of potassium oxide obtainable from the different resources:—

	1916 Tons.	1918 Tons.	1919 Tons.	Estimate at end of 1919 Tons.
Natural Salt Lakes in Nebraska, etc.	3,994	14,588	28,854	50,000
Water	—	6,092	10,862	28,000
Cement kiln dust	—	1,621	1,549	3,500
Blast furnace ash	—	0,185	0,230	—

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	1916 Tons.	1918 Tons.	1919 Tons.	Estimate at end of 1919 Tons.
Refuse of molasses distillation... ...	1,845	2,846	3,476	4,000
Refuse of beet-sugar refinery	—	0,369	1,213	2,000
Siliceous stone	—	—	—	—
Alum-stone	1,850	2,402	2,621	4,000
Kelp	1,556	3,572	4,804	5,500
Wood ashes	0,412	0,621	0,672	1,000
Others	0,063	0,305	0,289	1,000
Total	9,720	32,570	54,570	99,000

(5) Japanese Potassium Industry.

In Japan, for material for manufacture of potassium chlorate, potassium nitrate, potassium manures, etc., the annual output of potassium salts, a bye-product in the manufacture of iodine from sea-weeds in Hokkaido, Kanagawa, Chiba, Fukushima, and Miye Prefectures, amounting to about 1,700 tons, constituted the only material. Since, as the demand for potassium salts increased, the total wants for them reached some 10,000 tons. The shortage of material was made up with imports from Germany, free of duty. The imports consisted chiefly of potassium chlorate, such as potassium nitrate, potassium bichromate, etc., being in a comparatively small quantity.

Most of potassium chlorate used to be imported chiefly from Germany before the War. But, in 1914, the order was reversed to France, first, Germany, second, and Great Britain, third. In 1915, the import of German manufacture became completely blocked, and the order of the supplying countries was changed to the United States, Great Britain, and France. Since 1917 the imports from Great Britain, France, China, etc., combined, have gone only slightly above ¥100,000 per annum.

The import returns from 1913 to 1919 are as follow:—

	kin	value
1913	5,690,900	¥ 1,052,097
1914	4,444,500	870,094
1915	4,128,200	2,880,377
1916	1,733,800	1,761,960
1917	177,800	155,000
1918	50,800	64,000
1919	408,100	166,000

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With the stoppage of supply of potassium salts from Germany on the outbreak of the War, the industrial Japan was seized with a panic at the flight of their prices. To cite an instance, potassium chlorate, the demand for which is extensive as material for the manufacture of matches, military supplies, etc., used to b equoted at ¥17 or so per barrel of 112 lbs. The price rose by degrees, and by April, 1915, it reached ¥220 or fifteen times the pre-War quotation.

Potassium chloride, which serves as material for making potassium nitrate and other potassium salts, was quoted at about ¥80 before the War, but there was a time when the price soared up to ¥1,000. This extraordinary ascent gave a strong impetus to seek potassium resources in Japan, and potassium plants on limited scales sprang up like mushrooms.

Prior to the War, as stated previously, in such Prefectures as Hokkaido, Chiba, Kanagawa, Fukushima, Miye, etc., iodine was obtained from ashes of sea-weeds, and potassium chloride as a bye-product. The position of this bye-product became reversed before the War was over, and factories were founded in quick succession, in the above mentioned and other Prefectures, with the aim of manufacturing potassium chloride, which had been looked upon as a secondary product. In 1917, from the same source of material, 9,000 tons of potassium salts were put out, and it assumed the place of the leading source in Japan.

Again, bittern, a bye-product obtained in salt manufacture, was experimented upon, and in 1917, 1,300 tons of potassium chloride was procured. Other materials were also subjected to technical tests and could be turned to practical account.

The manufacture ot potassium chlorate from potassium chloride by electric solution grew popular, and, by the end of 1915, eleven plants were established, their number increasing to over sixty by the end of 1916. At the height of the production, as much as 8,000 barrels per month were put out, and if worked at the highest pressure, they could turn out 10,000 barrels per month.

Talking of potassium chlorate, its production since 1917 has exceeded the domestic demand and the surplus stock has been exported to China and the United States. In 1918, the export amount was more than ¥2,700,000.

For reference sake, the outputs of potassium chloride and potassium chlorate before and during the War are given below :—

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	Potassium chloride lbs.	chloride value	Potassium chlorate lbs.	chlorate value
1913 (before War)	4,451,967	¥ 107,136	—	—
1914	4,286,822	116,755	—	—
1915	7,440,275	678,839	4,163,273	2,551,030
1916	16,875,534	2,803,860	7,296,005	5,901,930
1917	19,466,656	3,261,175	13,294,721	8,158,137
1918	19,683,697	3,024,364	6,912,209	6,695,650

The following is the export table for potassium chlorate :—

	piculs	value
1917	25,822	¥ 2,384,000
1918	36,081	2,728,000
1319	27,916	1,395,000

Upon the termination of the War and restoration of peace, the potassium industry of Japan, like the manufacture of chemical substances in general, was dealt a serious blow, and at present, the potassium chlorate plants numbering more than 60 have all practically shut down, excepting a few which are continuing work. Correspondingly, the manufacture of potassium chloride forming the chief material for making potassium salts has also been suspended for most part.

Thus, the potassium industry of Japan has sunk to the bottom of decline from the height of erstwhile bustle.

(6) Potassium Resources Developed During War.

In Japan, the Tokyo Industrial Experimental Institute started a practical investigation of the available potassium resources in July, 1915. Such resources were classified into (1) sea-weed ashes ; (2) bittern ; (3) sugar-cane ash and refuses of molasses and alcohol manufacture ; (4) felspar ; and (5) tobacco plant-stem ashes. Each kind of material was subjected to a series of technical experiments, and the results thereof have been published by the Reports of the same Institute. Essays on the same resources by Dr. Tanahashi and other authorities on the same subject have also been put in print.

All hese reports and essays have been used for reference in writing the following articles.

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(a) Water of Natural Salt Lakes.

In the United States and the Tropics, in addition to the Dead Sea, salt lakes without outlets are found, and in some cases, the water of the lake contains a perceptible amount of potassium salt. It is noteworthy as a new source of potassium making that, during the War, such salt water was subjected to either natural evaporation by the sun and/or a crystalizing process for the manufacture of potassium salt.

In the United States, the major portion of potassium produced during the War was, as already mentioned, put out from lakes in Nebraska, etc. In Nebraska there were at the end of 1918 eight plants, inclusive of those already established and such as were under construction, having the total producing capacity of 50,000 tons of potassium oxide per annum.

There is a salt lake in Tunis (Africa) on the Mediterranean. By the sun evaporation and also by crystallization, 25,000 tons of potassium salts are said to have been put out in 1918.

There may be not a few other salt lakes which may permit of being similarly exploited.

(b) Cemet Kiln.

The recovery of potassium from the cement kiln dust was inaugurated in the United States after the outbreak of the War, and is counted among the most important potassium resources. This recovery originated in the application of a precipitator of the Cottrel system to the factory of the Riverside Cement Co., California, in 1913.

A suit was then instituted against the Company for the damage done to the orange crops about the factory by the cement kiln dust.

The fine dust put out from a cement factory has a soluble potassium, which, in some cases, assumes the form of potassium oxide amounting to 10%. By the installation of the dust precipitator not only the harmful dust has been got rid of, but also it has been turned to a profitable asset in the shape of a material from which potassium manure or potassium salts are made.

Just at this juncture, the great War happened to break out, cutting off the supply of German potassium. Consequently, the happy example of installing the

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cement dust precipitator has been followed in succession since 1914, totalling more than a hundred in the number of factories founded anew. For a time, the recovery of potassium from the cement dust constituted a more important object than the manufacture of cement itself.

In the recovery of potassium being effected at every cement factory in the United States, 100,000 tons of potassium oxide could be obtained, but seeing that it was not every factory that is equipped with the recovery contrivance, 50,000 tons would seem about the correct figure.

In Japan, the Asano Cement Factory, Fukagawa, Tokyo, has been extended steadily by stages with the rise of demand. At the same time, the question of the harmful cement dust was brought up from the viewpoint of the public hygiene, and, in pursuance of the American example, the Cottrel dust precipitator has been introduced.

This was the first instance, in which the cement dust has ever been utilized in Japan.

At the Asano Factory, 9-10 tons of cement dust has been gathered daily since 1919. It contains 6-8% of potassium and more than 30% of quick lime. From this, it may be regarded as a potassium or cement manure that may equal wood ashes in fertilizing property.

What has been offered for sale in a small quantity as a potassium manure (a bye-product of cement manufacture) these few years by the Japan Artificial Fertilizer Co., Tokyo, has been procured from the cement dust.

The production of potassium from this source requires no large outlay either in equipment or in operation. On the contrary, in some cases, the consumption of fuel has been reduced. This goes to confirm the belief that this particular resource of potassium manufacture may be easily perpetuated.

(c) Ash produced from Blast Furnace.

The recovery of potassium from the ash put out from the blast furnace of an iron and steel works has got out of the experimental stage at last recently, and is developing into a new commercial venture.

According to the practical experiments conducted at the Bethlehem Steel Manufacturing Co., the United States of America, in the event of a successful

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recovery of potassium from the blast furnace ash being realized, 200,000 to 300,000 tons of potassium oxide may be procurable from this source annually. At present (or at the time of this writing), there was only one steel works in the United States, which was provided with the recovery installation, but nonetheless how well this utility will be improved into a workable enterprise is worth following.

In Great Britain, too, the same potassium resource has been subjected to a painstaking investigation since 1915. As a result, a potassium manufactory has been established, the British Government owning half interest. To begin with, a factory has been founded near Birmingham, where 400 to 500 tons of potassium chloride may be turned out per week. At several other steel works in Great Britain, a like recovery scheme was under contemplation.

The use of the blast furnace ash as potassium material is still far from developed, but it has the advantage of purifying the gas, and this lends it an air of a commercially feasible venture. Especially, this problem cannot fail to be a highly interesting one in both Great Britain and the United States which are the two largest iron producing countries in the world.

(d) Felspar and Alum-Stone.

The attempt to obtain industrially potassium salts from felspar, alum-stone, etc., originates at only a recent date. It is true that how to get potassium from such as felspar appearing in a form of silicate has often been conceived and also experimented upon, but the process has not yet attained a stage, in which it can be incorporated into an industrial enterprise. There are many places in Japan where felspar occurs. But, according to the investigation of the Industrial Experimental Institute, Tokyo, the district near the Town of Nayeki in Gifu Prefecture and also about the Town of Ishikawa in Fukushima Prefecture yield the largest outputs. Adding the others elsewhere, the aggregate output of Japan is estimated at not more than 2,000,000 *kuan* or 16,666,666 lbs.

Felspar in Japan generally contains some 10% of potassium. Concerning the manufacture of potassium chloride from felspar, industrial experiments have been carried on, and the Cashman system experimented upon in the United States has been considered as the most desirable.

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By this system, felspar dust is mixed with quick lime, and to this mixture is applied a concentrated solution of calcium chloride, to turn it to a solid matter. Then it is subjected to a temperature of about 800° C. and is made into a soluble potassium which is then lixiviated in cold water, and from which potassium chloride is obtained.

The results of experiments show that much fuel is wanted for the above process, which circumstance raises the production cost above other methods and renders it unworkable commercially.

It is thought possible that in the United States, potassium chloride is not separated, but merely on the conversion of the insoluble potassium contained in felspar into a soluble matter, it is used as manure.

Alum-Stone contains potassium sulphate and aluminium sulphate. In Japan, at Tochihara in Harima Province (near Kobe), alum stone containing some 10% of potassium is found. It is ignited with sulphuric acid; the product is extracted and it is used for the manufacture of alum.

In the United States, alum-stone is mined in an immense quantity, and potassium is manufactured therefrom. In 1917, the potassium produced from this source took the third place.

The Mineral Product Co. was worked on alum-stone put out near Marysvale, Utah, and produced more than 600 tons of potassium sulphate of higher than 90%.

According to this method, alum-stone is calcined up to 1,000° and potassium sulphate is extracted therefrom by application of water, leaving impure alumina for dregs. This alumina containing cinnamic acid is not suited to the manufacture of aluminium. No way of utilizing it has yet been discovered. If, for the calcining process, dust coal is not used as the case has generally been hitherto, but instead the gas of the generator is used, the residue will have a smaller percentage of cinnamic acid, that is, only less than 0.5%. Then, the cinnamic acid and aluminium in the residue may be detached by means of flotation process. This Company is said to be planning to adopt this method so as to obtain both potassium sulphate and aluminium. The natural ore is credited with containing about 3.5% of cinnamic acid on an average and 10% of potassium.

In Japan the above source has the least possibility of being utilized as a potassium resource.

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(e) Sea-Weeds.

The manufacture of potassium from sea-weed ashes has been in vogue from ancient times. As the German potassium grew to be a dominating factor on the market, this primitive method could hardly hold its own and was receding into the background, when with the outbreak of the War, it came to be revived.

In the United States, it was on the Californian coast that the largest number of factories were established mostly on the old method. In a few cases, sea-weeds were sold as manure as they were; in other cases, only potassium salt was extracted. In 1919, the potassium output from this source amounted to only 5,500 tons.

In Japan, the major portion of potassium material was ashes left after sea-weeds have been burnt. In fact, potassium was bye-product of iodine manufacture totalling about 250,000 tons per annum.

The quantities of iodine and potassium salts found in sea-weed ashes vary according to the kinds of sea-weeds, tidal current, climate, etc., but they are on an average 0.3% of iodine and about 10 to 25% of potassium. The sea-weeds gathered along the coasts from Shima south of the Ise Grand Shrine (Ise Province) eastward to Awa and Kazusa east of Tokyo contain a comparatively large quantity of iodine, whilst those found along Hokkaido coasts have a larger quantity of potassium salts. As stated previously, before the great War, iodine was the primary product, and potassium only a secondary consideration. Now the iodine consumption of the world is put at 1,200,000 lbs. Out of 250,000 lbs. put out in Japan, 150,000 lbs. is exported abroad. As far as iodine is concerned, iodine is produced almost without stint in Chili (South America) as a bye-product of the manufacture of sodium nitrate which is a staple product of that country. Japanese iodine cannot compete with the Chili product. It is the wisest course for the Japanese to devote their attention to the increase of potassium outputs.

Japan is surrounded by the sea, and, in abundance of sea-weeds, she may be called unparalleled. Especially, a kind of sea weed known as *kombu* (a species of kelp) is found in an inexhaustible quantity. Twice annually, in spring and autumn, this particular kind of sea-weeds is washed upon the beach and forms a long heap. A large part of the same used to be left to decay.

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However, kelp contains 10 to 25% of potassium and its supply is practically inexhaustible. It is also good for iodine-making. Therefore, kelp may be held as one of the most productive assets in relieving dearth of potassium salts in the future.

In 1917, while the War raged, 9,000 tons of potassium chloride were manufactured from kelp, which yielded the major part of the entire production in Japan.

In making potassium from sea-weeds, it is made to exude from the ashes by means of water, and then it is crystalized by evaporation.

In the United States, a new method of potassium-making by the fermentation of sea-weeds was invented. The Hercules Gun-Powder Co. tried this method as an industrial experiment. By this method sea-weeds are made to ferment, and the various kinds of organic acids thus generated are mixed with lime and made into calcium salts. At the same time, through the fermentation, the cell-walls of the sea weeds get broken, causing the potassium salts contained therein to ooze out. By a proper method, the organic acids, calcium salts, and potassium salts are obtained by separate crystallization. The calcium salts of the organic acids will turn to ethyl-ester which is distilled by separate distillation.

This method, unlike any of the old systems, gives a valuable bye-product, helping to lower the producing cost.

A recent report says that this Company has suspended the operation of its plant at San Diego.

From a scientific viewpoint, this method is quite interesting, but as an industrial enterprise, it seems to await further study in several respects. After all, it is a pity the above method appears to have been one of the "war time mushroom industries."

(f) Tobacco Ashes.

In 1898, when the Tobacco Monopoly system was introduced in Japan, the Tobacco Factories belonging to the Government Monopoly Bureau produced a large quantity of waste in the matter of stems of tobacco leaves, odds and ends of cut tobacco, etc. The authorities, at first, did not know how to dispose of the waste, for the waste contained some tobacco which might be smoked. The waste was experimented upon as insecticide, bone black, manure heaps, etc., but it often led to the violation of the Monopoly Law.

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The leaf stem contains 25% of potassium and the roots and stems of the tobacco plant from 30 to 40%. It is only rational to turn them into potassium-manufacturing materials. This feature appealed to the authoritie, and they, conjointly with private individuals, set about founding the enterprise. At present, the Japan Chemical Industry Co., Ltd., and others, combined, are turning out thousands of tons of potassium fertilizers.

The tobacco leaf stems put out in Japan are put at about 2,500,000 *kuan* or approximately 20,833,333 lbs., whilst the roots and stems of the tobacco plant at about four times as much. The latter being more difficult to be obtained, all that is available for practical use may be estimated at one-third of the total, that is, about 6,944,444 lbs. The ashes obtainable from these materials are about 4,166,666 lbs. from the leaf stems and 2,750,000 lbs. from others, making the total 6,916,666 lbs. In the former, potassium chloride and potassium carbonate are found in about the same quantity, in addition to a comparatively small amount of potassium sulphate. Thus, the manufacture of potassium salts from the tobacco stems and roots may be carried on by the lixiviation of the ashes, and the results depend upon the density of the lixivium and the progress of the separate crystallization process.

From the manufacturing returns of the Tokyo Industrial Experimental Institute, this particular source of material (comprising 4,166,666 lbs. of ashes from the leaf stems and 2,750,000 lbs. more from the others give potassium salts (inclusive of potassium chloride, potassium carbonate, and potassium sulphate) to the following amounts:—

From leaf stems	1,608,333 lbs.
From Others	1,613,333 lbs.
	3,221,666 lbs. or about 1,400 tons.

Remarks: The potassium percentage of the leaf stems is put at 25%, of which 84.6% is estimated as obtainable. As to the percentage for the others, comprising the tobacco plant stems, roots, etc., the potassium percentage is put at 45%, of which 84.68% is accepted as obtainable.

The leaf stems and others vary in price according to places in Japan. The difference is the widest with the tobacco plant stems. Especially, during the war time, owing to the increase of demand, their prices rose sharply in a fickle manner and it was difficult to figure out exactly the cost of production.

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If these raw materials can be gathered at a few points in a large quantity as material for manufacture of potassium salts, it would be more economical and also profitable than to offer the ashes for sale as fertilizer or to use them as raw material.

However, supposing that the whole of the material should be obtained, the total outputs of potassium salts would amount to only 1,400 tons.

Then, speaking of production cost, the leaf stems, etc., cost decidedly dearer than kelp, and on this account, much cannot be expected from this source.

(g) "Bagasse" and Syrup—and Sugar Cane Residues.

Bagasse. The sugar cane, on which depends sugar manufacturing in Formosa as raw material, is used to the total extent of about 2,000,000,000 lbs. inclusive of such as are used by the sugar refineries worked on modern systems only. The *bagasse* left therefrom reaches some 200,000,000 lbs. This is used wholly as fuel, and the ashes are generally employed as manure. Now, the ashes obtainable from *bagasse* are put at about 2.8%. Supposing that all the *bagasse* amounting to 200,000,000 lbs. be cinefied, some 5,600,000 lbs. of ashes will be had. However, in fact, the loss of ashes through the high temperature draft in the furnace and also the way they are handled after the combustion is over is held as considerable, which also means a corresponding waste of potassium.

However, the results of an analysis at the Tokyo Industrial Experimental Institute show that the potassium percentage containud in the *bagasse* ashes is only 1% in the form of potassium oxide on an average, and in order to evaporate the resultant solution, much fuel is required. The ashes are being utilized as fertilizer, and they cannot be viewed as an economically feasible material for potassium manufacture.

Syrup ashes. While sugar is expressed out of the sugar cane, a large part of potassium salt, too, is detached by solution, and is left in the residue. The syrup put out at the modernly equipped sugar refineries in Formosa amounts to about 40,000 tons per annum, of which about half is consumed for the manufacture of alcohol.

By the experiments conducted at the Industrial Experimental Institute, Tokyo, from syrup, about 8.4% on an average of ash is obtainable. By steeping the ash in water, potassium oxide amounting to about 35% may be detached as a soluble.

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The simplest way to manufacture potassium salt from syrup is to cinefy it, and then to steep the ashes in water, to educe the potassium, and to evaporate and to crystalize the solution. The potassium, for most part, assumes the form of potassium sulphate and potassium chloride, what other salts there are left being in but an insignificant quantity. In order to obtain potassium sulphate and potassium chloride from the educt, it may be evaporated and detached from each other by separate crystallization.

The returns of the Industrial Experimental Institute indicate that the potassium salts to be had from the treacle amount to about half the amount of the ashes, they being composed of potassium sulphate of 97.4% in purity and potassium chloride of 82.2% in purity corresponding in quantity to about 4% of the treacle itself.

The whole treacle to be had in Formosa is about 40,000 tons, and from this some 1,570 tons of potassum sulphate and potassium chloride put together may be obtainable.

However, in the utilization of the treacle, the sugar left therein should be procured or it may be, to no less advantage, employed for the manufacture of alcohol, confection, etc. It is considered as hardly worth while to use it as a potassium manufacturing material. It will be better to subject the residue left after the above mentioned processes of utilization have been gone through to some operation for the extraction of what potassium there is still left as a bye-product.

Residue left after distillation of alcohol. The residue left after alcohol ash been got from the treacle by distillation is thrown away as waste matter. But, as in the case of treacle itself, the residue fluid retains a larger portion of potassium salt. According to the experiments carried on at the Industrial Experimental Institute, the residue contains only 1.5% of ash, of which about 35% is potassium oxide.

For the manufacture of potassium salts from the residue left of treacle after distillation of alcohol, it is first heated to cause the water to evaporate. It will prove a solid mass of black colour not so viscous as treacle. On application of high temperature, the solid mass will not expand like treacle and may be more easily cinefied. A similar process to the extraction of potassium salts from treacle may be applied to the solid mass above mentioned.

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The results of experiments of the Industrial Experimental Institute put the total quantity of potassium salt obtainable as potassium sulphate of 98.2% and potassium chloride of 88.8% perity at 0.6-0.1% of the residue left after distillation of alcohol.

It is unascertainable just what percentage of treacle put out in Formosa is being utilized for the manufacture of alcohol, but supposing half the total be turned to this particular use, the potassium salts obtainable from the waste fluid will be some 790 tons.

This waste fluid, if allowed to run into land under cultivation, will do harm to the crops, and on this account, the Sugar Refineries find it much bother to dispose of it. If the same could be utilized for making potassium salts, that would serve the dual purpose of utilization of a waste matter and disposal of an obnoxious matter. Only, a thin fluid containing only about 1.5% is to be evaporated, and then the ash lixivium must be also evaporated, thereby a large amount of fuel being required. This will tend to throw the utilizing process above indicated out of the pale of commercial workability. If evaporation by the sun is possible in those districts, potassium salts may be put out on more moderate terms.

(h) Other Vegetable Ashes.

Other vegetable ashes than already mentioned may be worth mentioning.

The wild banana-tree thrives in the field and on the hillsides in Formosa. It is cinefied and then caused to exude in water. This liquid is then evaporated and thickened. It principally consists of potassium salts. The liquid is hardened into almost a solid mass; in other cases, it remains in a liquid state, only about as thick as sesamum oil.

The ashes given by the wild banana-tree and the ordinary banana-tree contain from 18 to 26% of potassium oxide, most of which consists of potassium chloride and a trifling amount of potassium carbonate. The solid mass contains 60% of potassium, and the liquid some 30% thereof. Potassium carbonate exists in the largest quantity; potassium chloride comes next; and there is but a small quantity of potassium sulphate.

The native farmers of Formosa produce these outputs as a bye-industry, and use them as a dye, a preservative for food, etc. Hitherto there has been only

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a limited demand, and the output has been correspondingly small. If their production should be encouraged in a suitable manner, there are plenty of material to work upon. Wild banana-trees are found in profusion especially in the mountainous districts. Then, there are the odds and ends of the camphor tree thrown away after the extraction of camphor. These may be also utilized as potassium material.

However, now that peace reigns, whether or not the exploitation of potassium resources on an extensive scale is economically feasible is an open question.

Among the herbage growing wild in Japan, there are several kinds such as the bracken, net-fern, horse-thistle, mother wort, giant knotweed, etc.

However, the extraction of potassium from any of these herbs on an industrial footing is believed to be a thing unattainable.

(i) Bittern.

Bittern given as by-product in salt manufacture principally consists of magnesium chloride, magnesium sulphate, magnesium oxide, magnesium bromide, etc., in addition to common salt.

At present, about 1,000,000 *koku* of bittern is obtainable in Japan, but some 600,000 *koku* thereof is left unprocured.

The uses of bittern are confined to the manufacture of *tofu* (bean curd), *fu* (a kind of cracknel), some kinds of manure, pottery, tiles, etc., and also the preparation of *kombu* (edible seaweed), cleaned rice, some kinds of medicines, etc.

As material for making potassium salt in the future, at least 350,000 *koku* of bittern may be available.

According to the reports by the Industrial Experimental Institute, Tokyo, bittern put out as bye-product at the noted salt manufactories in Japan contains, in addition to about 3% on an average of potassium chloride, some 33% of magnesium salts (consisting of 23% of magnesium chloride, 8% of magnesium sulphate, and a trace each of magnesium bromide and magnesium oxide), besides 6% of common salt.

As regards the manufacture of potassium chloride from bittern, the same Institute has published a detailed report, to which reference is invited.

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Now, the potassium chloride contained in the total 350,000 *koku* of bittern available at present in Japan, as above noted, is estimated at, about 2,100 tons. Supposing that 80% of this is obtainable, it amounts to some 1,860 tons. If 138,000 *koku* of bittern now used for making solid bittern is made available also, the total of about 2,300 tons of potassium chloride will be had. In short, the controlling factor of the production cost of potassium chloride chiefly consists of the prices of raw material and fuel.

If further utilities of magnesium chloride and magnesium sulphate and also the manufacture of magnesium bromide should be studied out, this enterprise is believed to be raised to a more profitable footing.

However, the percentage of magnesium chloride contained in bittern is too small to be organized into a separate enterprise, conjointly with the manufacture of common salt, magnesium salts, etc. For this reason, it is difficult for us to express an explicit opinion as to the possibilities of an undertaking to manufacture magnesium chloride.

Moreover, the outputs of bittern are quite fixed, as above hinted, and even granting that what is produced in Formosa and the Kwantung Leased Territory should be rendered also available, it will hardly justify a belief that this cource of supply will brighten the future of the potassium salt industry of Japan.

In 1917 (during the war), as much as 1,300 tons of potassium salt was procured from this source, but how far this venture can retain its ground against the importation of North German potassium remains to be seen.

(J) Soap-Suds left after Wool is Washed.

The soap-suds left after wool has been washed are taken but little notice of as a source of potassium supply.

The soap-suds contain a reasonable amount of potassium, it is true, but its recovery will rarely pay unless it is carried on on an extensive scale. Accordingly, the soap-suds are generally thrown away.

Only, during the War and prior thereto, in some parts of Belgium, France, and Germany, soap-suds used to be employed as potassium material.

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Chapter II. Kaoliang Stalk Ash in South Manchuria.

(1) Kaoliang Stalks in South Manchuria and their Utility.

Kaoliang forms an essential article of food-stuffs to the Chinese inhabitants of Manchuria. It is their staple food-stuff. It is also used sometimes as a feed to cattle. It is grown ubiquitously in Manchuria to the remotest villages.

The outputs of Fengtien Province only are rated at some 10,000,000 *koku*. Kaoliang occupies the foremost place on the list of grain produced in South Manchuria. Accordingly, from the area of cultivation, the stalks yielded reach an enormous amount, outstripping those of all other kinds of cereals.

Quoting the "Statistics of Raw Materials" published as appendix to "Things Manchurian" written in Japanese and published by the General Staff Office, Tokyo, the stalks, stems and straw of the chief cereals in Fengtien Province are as under :—

		Per hsiang (or 1860 *tsubo*.)
Kaoliang stalks	6,962,650,000 lbs.	@ 4,000 lbs.
Italian millet straw	1,133,166,666 lbs.	@ 4,000 lbs.
Maize stalks	633,775,000 lbs.	@ 2,000 lbs.
Beans stems...	221,541,666 lbs.	@ 250 lbs.
Wheat straw	132,983,333 lbs.	@ 750 lbs.
Cock's shin straw	113,075,000 lbs.	@ 1,083 lbs.

As indicated above, the stalks of kaoliang produced in Fengtien Province is more than three times as large as all the rest combined.

Part of the kaoliang stalks put out in such an immensity is used as fodder for the domestic animals. Part thereof is used as building material for roofing, and also as supports of the walls for the Chinese huts. Sometimes, they are used for making fences and building bridges. Also the skin of the stalks is used for making matting. There are other uses, but a large part of the stalks is consumed as fuel at the Chinese households. Especially in a district like South Manchuria, in particular, in Fengtien Province, which, excepting the eastern frontier regions, is a vast level plain bereft of forests or woods, there is no way to obtain fuel, except coal which is too expensive to the Chinese peasantry. For, owing to the lack of modern means of communications, the cartage costs too high to place coal within reach of the country farmers a good distance from the railway. As things stand, the Kaoliang stalks are indispensable to the Manchurian peasants as the only article of fuel available.

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There has been a project to make pulp out of the kaoliang stalks, but any such undertaking, that will require kaoliang stalks for raw material, is bound to undermine the fuel institution of the Manchurian peasantry, and its establishment and maintenance are thought to be beset with difficulties.

(2) Kaoliang Stalk Ashes and their uses.

In Japan and also in foreign countries, the ashes left by the combustion of wood and other vegetable matter contain a certain amount of potassium and are used as manure after being mixed with something else or, in some cases, by themselves.

In Japan, in the line of potassium manure, there has been scarcely anything but ashes.

In South Manchuria, the soil is alkaline almost everywhere. At some places, when it is particularly dry in spring and autumn, alkaline spots will appear on the soil. Although land which is excessively alkaline is not cultivated, in the rest, kaoliang and other crops are raised.

The Kaoliang has the greatest resistant power against alkali, of all kinds of crops. It is grown even where nothing else can thrive. Such accounts for the extensive cultivation and splendid growth of the kaoliang in the strongly alkaline soil in South Manchuria. In such places, the red loam at the foot of the hills is often gathered and put on the soil under cultivation, as if it were a layer of manure. It may be mentioned that fertilizers do much less good to the crops than they ought to in ordinary circumstances. Especially, such alkaline manure as ashes of kaoliang stalks, etc., is of very little value. Only a small portion is mixed with heaped manure. Thus in South Manchuria, kaoliang stalk ashes are valued but little as manure, and the Chinese peasantry know only to throw them away as waste matter.

According to the results of analysis at the South Manchuria Railway Company's General Laboratory, Dairen, the ashes dried in the atmosphere of the kaoliang stalks comprise the following :—

Ashes of the stem	1.1%
„ „ „ leaves	2.6%

The stalks make up the most part of the kaoliang husks. Then, the loss through the draft, etc., while in the process of combustion, and also incomplete

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combustion must be reckoned with. So, the ashes obtainable from the kaoliang stalks put to by the Chinese peasantry may not exceed 1% or so.

Now, calculating the total outputs of the kaoliang stalks at 6,958,333,333 lbs., one quarter thereof may be allowed for building and household purposes by the native peasantry. The remaining 521,875,000 lbs. may be put down to be for fuel. Computing the amount cinefied to be 1%, the total quantity of ashes obtainable in Fengtien Province will come up to 52,083,333 lbs, which have hitherto been thrown away as worthless.

In South Manchuria, too, crude potassium salt has come to be manufactured from the kaoliang stalks in South Manchuria, and this should be commended as sensible for utilizing what has been regarded as waste matter.

(3) Manufacture of Potassium from Kaoliang Stalks.

As to the ingredients of kaoliang stalks, no final verdict of analysis has yet been rendered. Consequently, it is not yet ascertainable just what can be the total percentage of potassium contained in the ashes and what can be the respective quotas of potassium salts.

However, from the various reports on the subject, the potassium percentage in the kaoliang stalk ashes is estimated at 8 to 10%, in contrast with 10 to 25% contained in kelp, which constitutes the principal potassium material in Japan.

During the Great War, along the South Manchuria Railway Manchuria Lines, the potassium ingredients in the kaoliang stalk ashes were made to exude in water and were then evaporated and crystallized. The crude potassium thus obtained at several points in South Manchuria along the Railway was analyzed at the S. M. R. Co. General Laboratory, Dairen, according to which analysis, some idea of the soluble ingredients and potassium salts in kaoliang ashes may be had.

They are as follow :—

	Moisture	Chlorine	Sulphuric acid	Carbonic acid	Potassium oxide
Kungchuling... ...	14.43	9.94	12.15	11.42	48.08
Fengtien (Mukden).	9.91	10.73	16.21	5.08	46.42
Liaoyang	9.71	21.30	14.40	4.59	38.08
Lishan	13.32	16.51	11.78	6.19	42 33
Chienshan	10.35	20.41	13.83	5.01	39.13
Nantai	15.37	23.96	6.34	6.29	40.23
Tangkangtzu ...	7.72	20.06	18.27	4.59	38.23
Average	11.54	18.49	13 28	6.17	41.78

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From the above table of analysis, most of the soluble salts are found to be potassium salts consisting mainly of chlorides, potassium sulphate, and potassiumcarbonate. It strikes one as rather strange that as it goes farther north, potassium carbonate increases gradually in percentage, whilst a sharp decrease of chlorides is observed. On the contrary, as one comes down south, one will notice quite a contrary tendency. It cannot be that the kaoliang stalk ashes differ in their ingredients according to the northern and southern parts of Manchuria. It must be due to some more rational cause. For instance, the natives may use other than kaoliang stalks for fuel according to locations, and, in fact, in the southern part, maize stalks and millet straw are also used in a considerable quantity.

From the average contents of chlorine, sulphuric acid, and carbonic acid, as tabulated above, they will, when converted into potassium salts, yield roughly 40% of potassium chloride, 30% potassium sulphate, and 20% of potassium carbonate.

How to recover potassium salts from kaoliang stalk ashes. Generally speaking, the recovery of potassium salts from vegetable ashes has been in vogue from early times. The process of extraction has varied more or less, it is true, according to the varying percentages of potassium salts the ashes contain. Nonetheless, the processes are all simple and alike. In short, they may be divided into the lixiviation of the ashes in water and the evaporation and separate crystallization of the liquid. The recovery of potassium salts from kaoliang stalk ashes may be effected on similar lines. For the necessary equipments, a tank for lixiviation, a kettle, and a furnace will quite do. The tank may be made of wood, and either round or square in shape according to its capacity. A round one, about 5 ft. in diameter and 4 or 5 ft. in height, may be found convenient. At the bottom of the tank, gravels may be laid to a thickness of from 1 ft. to 2½ ft. This layer of gravels may be covered with hemp cloth or some other kind of cloth which will serve filtering purposes. In the bottom, a small hole may be made so as to let out the filtered liquid. Over the filtering cloth, kaoliang ashes may be put in a uniform thickness so as to make the lixiviating process as complete as possible. Over the ashes may be put a suitable amount of water, say, from 5 to 10 *koku* of water for some 3,333 lbs. of ashes. The hole in the bottom may be kept stopped sufficiently long to permit of the lixiviating process being well started. Then, the first portion of the filtered fluid may be obtained. But since the potassium percentage is lower in kaoliang

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ashes than in tobacco stem ashes and kelp, the lixivium may be found to contain only 10° Be. or so, as against 20° Be. or more in the case of tobacco stem ashes and kelp. The ashes left in the tank may still contain some potassium and may be subjected to another lixiviating process, but the lixivium being necessarily of lower concentration, the liquid may be used for a new layer of ashes.

The lixivium may be led to a larger tank for storage. Then it may be put in an evaporating iron pan to be heated with the waste heat of the furnace. As the contents of the pan evaporate, more lixivium may be added so as to keep it always full for a few days. As the lixivium grows thicker, it is transferred to a larger pan put on another furnace, and a high temperature is applied thereto for several hours, so that all the combustible portion of the contents is mostly burnt, and then the contents begin to melt. When the melting process is completed, the contents glow like molten iron. They are then ladled out to get coagulated. This is a crude potassium containing a mixture of potassium chloride, potassium sulphate, and potassium carbonate. Next, these potassium salts must be separated. They are solved in water heated to a proper temperature, and then subjected to evaporation and separate crystallization.

In Manchuria, the Sanyi Kungsu (Yingkou) and the Manchuria Kalium Co., Ltd. (located at Hsiaokangtzu, Chinese Quarter of Dairen) once carried on the separate crystallization of the potassium salts, but no detailed record exists concerning these experiments.

In this connection, the separate crystallization process conducted at the Industrial Experimental Institute, Tokyo, may be given for reference sake :—

The potassium salts contained in the tobacco stem ashes consist of potassium chloride, potassium, carbonate, and potassium sulphate, similarly to kaoliang stalk ashes. However, since the respective percentages of the potassium salts are different, the exactly same process of separate crystallization cannot be adopted. Especially, the concentration and cooling degrees must be different, but the crystallization process being considered as practically similar, the crude potassium obtained from the kaoliang stalk ashes may be also subjected to the separate crystallization process.

According to the experiments made by the Industrial Experimental Institute, Tokyo,

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1) When the lixivium is cooled down to from 40° to 50° C. as the density (or concentration) reaches 30° Be, a crystallization of potassium sulphate (of 73% in purity) is obtained.

2) When the mother liquidis cooled down to the ordinary temperature, potassium chloride (of 78% in purity) containing a good quantity of potassium salphate is obtained.

3) When the mother liquid is heated and evaporated to 40° Be, and then is allowed to cool down to the ordinary temperature, a crystallization of potassium chloride (of 80% in purity) is to be had.

4) If the mother liquid is heated and evaporated further so as to raise it higer than 50° Be, sodium carbonate is cryatallized out. If the liquid is cooled off to the ordinary temperature, the remaining potassium chloride and potassium sulphate are obtained in equal quantities.

5) If the mother liquid is raised to 60° Be. and is then cooled off to the ordinary temperature, a crystallization of potassium carbonate is yielded, and if the remainder is dried solid, potassium carbonate of about 60° in purity is given.

The rate of potassium obtainable from the tobacco stem ashes, as experimented upon at the Industrial Experimental Institute, Tokyo, is about 85%, the balance of 15% being lost during the lixiviating and other processes.

In the case of kaoliang stalk ashes, too, the rate of potassium available, when the undertaking is conducted on an industrial footing, should be put at about 85%.

Now, if the potassium contained in kaoliang stalk ashes is figured at 9%, the actual potassium rate obtainable industrially may not be more than some 7.65%.

The respective rates of the different potassium salts, according to the returns of the Sanyi Kungsu, Yingkou, during the War time, were 44% of potassium chloride, 32% of potassium carbonate and 24% of potassium carbonate, the purity of none being ascertainable.

Gathering of kaoliang stalk ashes. In manufacture of potassium from kaoliang stalk ashes in South Manchuria, the point to be considered first of all is how much kaoliang ashes may be gathered. As an enterprise for, say, the Japanese in a territory like South Manchuria, which, excepting the cities and towns on the Railway,

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is still grovelling at a low level of civilization, and which is possessed of meagre facility of rapid communication, no little difficulty must attend the gathering of kaoliang ashes among the Chinese rural homes inhabited by a people of different language and customs. It will be easy to imagine how high the ash-gathering cost will rise.

Seen from the mere consideration of the existing means of communications, it will be quite out of the question to try to gather kaoliang ashes all over the extent of Fengtien Province. And, if the accumulation of kaoliang ashes containing not more than 9% of potassium at such a few centres as Dairen, Yingkou, or Fengtien (Mukden) be attempted, the freight expenses required for the purpose will make the venture anything but paying. Therefore, the ash-gathering work may be conducted, beginning with the gathering of the ashes at convenient points, which may serve as the centres for a couple of days' foot journey at most. At these points, the ashes mayundergo at least the lixiviating and evaporating processes, to be reduced to a crude potassium. Then, the outputs may be forwarded either by waterway or by rail to Yingkou or Dairen to be refined.

Also, even the points where the ashes are to be reduced to crude potassium should be chosen from among such places as have transporting facility available at as low rate as possible. From this consideration, they must be located not far from the South Manchuria Railway lines.

Therefore, during the War, Kungchuling, Fengtien (Mukden), Liaoyang, Lishan, Chienshan, Nantai, Tangkangtzu, etc., were selected for such purposes.

Thus, the scope of territory, in which kaoliang ashes may be gathered, is very much narrowed and confined to the prefectures adjoining the Railway Lines.

Now, the areas of such Prefectures, together with the supplies of kaoliang stalks, kaoliang ashes, and crude potassium obtainable, may be tabulated under:—

	Area square Japanese *ri*	Kaoliang stalks unit: 1,000 *kuan*	Kaoliang ashes (1% of stalks) unit: *kuan*	Crude-potassium @ 7.5% of ashes unit: *kuan*
Kwantung Leased Territory...	200	7,935	79,000	5,925
Fuchou	296	6,469	65,000	4,875
Kaiping...	254	30,196	302,000	22,650
Haicheng	222	56,211	562,000	42,150
Liaoyang	348	38,320	383,000	28,650
Shenliao	218	34,810	348,000	26,100

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	Area spuare Japanese *ri*	Kaoliang stalks unit: 1,000 *kuan*	Kaoliang ashes (1% of stalks) unit: *kuan*	Crude potassium @ 7.5% of ashes unit: *kuan*
Fushun	146	3,500	35,000	2,625
Tiehling	158	38,933	389,000	29,175
Kaiyuan	239	19,718	197,000	14,775
Changtu	237	57,722	577,000	43,275
Lishu	194	62,936	629,000	47,025
Huaite	139	28,138	281,000	21,075
Itung (Kirin Province)	259	23,574	236,000	17,700
Total	about 3,000	about 400,000	about 4,000,000	about 300,000 or about 1,111 tons.

Remarks: The territory along the Mukden-Antung Line is mountainous and has scanty facility of communications. Moreover, kaoliang stalks are put out from that region in too limited a quantity to make them an industrial raw material.

As above tabulated, the aggregate outputs of kaoliang ashes along the South Manchuria Railway Lines are about 33,333,333 lbs. or 14,814 tons, and the total volume of potassium recoverable by industrial process is not only about 1,111 tons, which, when converted to sundry potassium salts such as potassium chloride, potassium carbonate, and potassium sulphate, all of a suitable degree of purity, may amount to some 1,500 tons.

It may be mentioned that the total area of the thirteen prefectures mentioned in the above table is 3,000 square Japanese *ri* (1 *ri* being 6½ square miles approximately).

Now, with the existing facilities for communications in South Manchuria, to gather the kaoliang ashes from so vast an area to the several crude potassium factories is no light task. Then, it would be impracticable to look for further supply in the districts beyond these prefectures. Even in these prefectures, the most remote parts thereof will be found quite inaccessible for the purpose of gathering the ashes. On this account, what area of these prefectures there is available for the purpose abovementioned may be said to be confined to a narrow belt adjoining the railway line.

The maximum outputs of potassium oxide being only a little over 1,000 tons, it would sound rather exaggerating to talk of raising the potassium industry of Japan to something like a self-supplying plane.

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As a means of gathering kaoliang ashes, gunny bags may be hired out to Chinese farmers to gather the ashes and carry the gunnies to the specified points to be delivered to the buyers.

At any rate, unless the means of communications in South Manchuria is materially bettered, the difficulty in gathering the raw material will remain, to no little detriment of the potassium industry.

The price of kaoliang ashes has no standard and varies according to places. As they have been looked upon as waste matter, the price itself is still quite low, and the gathering cost makes up the heaviest item.

However, it goes without saying that, once it is known among the Chinese farmers that kaoliang ashes are no longer waste matter, but a commercial asset, they will naturally rise in price.

Therefore, supposing that potassium salt industry should be built some day, upon the kaoliang ashes in South Manchuria, it would be difficult to compute to any approximately reliable margin the actual producing cost.

(4) Future of Potassium Manufacture from Kaoliang Stalk Ashes.

As already remarked, the manufacture of crude potassium salts was carried on a small scale during the late War at Kungchuling, Fengtien, (Mukden), Liaoyang, Lishan, Chienshan, Nantai, Tangkangtzu, etc., along the S. M. R. Co. Manchuria Lines, and the outputs of these factories were forwarded to either Yingkou or Dairen to be refined at the hands of the Sanyi Kungsu, the Manchuria Kalium Co., Ltd., etc. The market price of crude potassium salts at Yingkou and Dairen is said to have been about Y112 per 100 *kin*.

When potassium salts were dear priced as during the War, even if the refining expenses were added, this industry could be still an amply profitable one.

With the return of peace, this particular industry has ceased to be workable.

Unless crude potassium salts be quoted at least lower than Y5 per 100 *kin*, the refined product will not be admissible to the market as a merchandise permanently sustained.

When one weighs carefully the progress of civilization in South Manchuria, the existing communications system, the meagre percentage of potassium contained

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in kaoliang stalk ashes, the thinness of the lixivium in concentration, the high fuel cost for the evaporating process, and the dear freight on the product to Japan, the proposition of building up a permanent enterprise of potassium salt manufacture on the kaoliang stalk ashes would seem very doubtful, especially when the alternative of depending on kelp for raw material in Japan, and also the reimportation of North German products are taken into consideration.

Then, from the view point of producing capacity alone, any such idea of planning the independence of the potassium industry in Japan, as advanced by a few interested parties, would be little short of a fool's vagary.

Only, the recovery of potassium salts from vegetable ashes can be effected in a very simple manner and may be resorted to in order to meet some urgent need. For this reason, in time of emergency, when the demand for potassium salts has suddenly risen and their prices have sharply ascended, the potassium recovery on the lines as stated above might be found handy.

Conclusion.

As remarked already, the stoppage of North German supply on the outbreak of the War having dealt a severe blow to the chemical industry of the other countries, they all strove hard to find as many potassium resources as possible, and succeeded, in several ways, in hitting upon happy plans.

Since the return of peace, when these countries have set about organizing a system of self supply of potassium, the North German products have started to flow into them like a tide.

Of the new potassium resources, such as cement kiln dust, blast furnace ashes, natural salt water, etc., hold out some promise each, but none of them has yet quite passed out of the experimental stage. Each experiment offers sufficient interest theoretically, but as a practical business venture, none of them looks destined to develop into an industry of any importance.

In point of the inexhaustible supply of raw material and the low producing cost made possible through scientific and economic devices, the North German potassium industry, organized upon a strong enduring system which used to dominate the world's market, now threatens to reassert its old time monopoly.

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One point of curiosity is how far the Alsace potassium bed and the Catalonia bed will be capable of carrying on their competition with the North German dominator.

The long and short of it seems to be that, in no distant future, the potassium beds of North Germany, Alasace, Catalonia (Spain), etc., will dominate the potassium industry of the world.

As stated in detail, the possibilities of the potassium enterprise depending on the kaoliang stalk ashes in South Manchuria are far from elastic, as made out to be by some interested parties, and may more properly be regarded in the light of a War time venture.

HOT SPRING COLONY FOR PRIMARY SCHOOL CHILDREN.

At Hsiungyocheng.

How Experiments Have Fared.

By Sanitary Office, South Manchuria Railway Company.

Preface.

The school hygiene has an important significance to the improvement of the physical culture of a people. Manchuria, because of its climate tending to be extreme, compared with Japan's, demands that the betterment of the school hygiene shall go hand in glove with that of the public hygiene.

In particular, in the wake of the great War, the school hygiene in Europe and America has received a great impetus to be pushed ahead towards an ideal perfection.

The South Manchuria Railway Company, for the benefit of the Primary School children in the South Manchuria Railway Area, has been holding bathing practices for the more robust children from the interior on the suburban beaches of Dairen every summer since 1910.

For the sake of the feebler children not strong enough to rough it through the sea-bathing practices, a hot spring colony was conceived and organized at

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Hsiungyocheng, one of the three hot spring resorts in Manchuria during the summer vacation in 1918. This initial experiment was believed to bear satisfactory result, and it has been repeated every year since.

The object of this colony is to husband the resistant power of the weaklings, to better their constitution, and to equip them better in their fight against tuberculosis.

AT TABLE.

Such experiments are novel in Japan, and their tangible results will be found of dual interest.

The repeated experiments on the hot spring colony have been carried out on the undermentioned principles:—

1) To blend in practice medical science and education, to protect the feeble children, and to realize the aim of bettering their constitutions.

2) To stress upon the recuperation of both body and mind, and to hold the class work as a secondary consideration.

I. Initial Experiments.

(A) Location.

In South Manchuria, there are three hot springs at Hsiungyocheng, Tangkangtzu, and Wulungpei.

Hsiungyocheng gives not only clear hot springs, but its picturesque scenery renders it the best suited to be the seat of a colony as above mentioned.

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The Railway Station of Hsiungyocheng is at 112 miles north of Dairen. The hot-springs are located at a distance of about a mile and a half from the Railway Station, with which they are connected with donkey cars drawn over light rails.

The Hsiungyo River, which flows below the Hot Spring Hotel, is fringed with broad stretches of beaches of clean, glistening sands strangely devoid of stones. Here and there in the sands and even in the midstream, the River being deep half way up the knee, or more generally only ankle-deep, hot springs spout out. The whole of the neighbourhoods is devoid of any dangerous feature—it might be a deep creek or rapid current, or a steep cliff. One may choose between a plunge in hot spring bath-tubs and a sand bath (bathing in any desired depth of hot spring in a sandy hollow), and dipping oneself in the shallow crystal water of the River. Moreover, the surrounding scenery reminds one of the beautiful Japan.

On the east, there is a pine grove containing thousands of old pine trees and spotted with green grass plots. Not only the eyes delight in the fine scenery, but the air is always fresh and untainted by smoke or filth. Then, there are noted resorts within easy access, and the sea breeze creeping over from the Gulf of Pechili is refreshing. All go to make this spot an ideal one for the purpose.

"LOOKING PLEASANT."

(B) Arrangements.

(a) For the children's quarter, the school house of the Primary School, about

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1 2/7 miles away was used. 180 mats (Japanese *tatami*) were laid and were disposed as under:—

1) Living and sleeping rooms ... ... 40 *tsubo* (2 mats making up 1 *tsubo*)
2) Recreation room ... ... 35 „
3) Medical Room and Nurses' Rooms ... ... 20 „
4) Messroom ... ... 10 „
5) Lavatory, etc.

(b) For bathing purposes, a hot spring bath-pool (roofed) was prepared improviso, 18 ft. by 12 ft., in addition to a sand-bath area (also roofed), 30 ft. by 18 ft.

Besides, a rest tent, a mess room, and a napping room, a shed in a glade (of 15 *tsubo*), etc., were provided.

An area of about 10,000 *tsubo* on the sandy bank was used for sundry purposes, together with another area of about 3,000 *tsubo* in the adjoining pine grove.

(C) Children for Colony and Its Term.

As it was the very first experiment, the children to be admitted to the colony were limited to thirty, and they were selected with due care from among the 4th, 5th, and 6th year grade children. The actual number of boys accommodated were 26, the remaining four having been prevented from turning up by illness or other causes.

The term of the colony ran for three weeks from July 22 to August 11, 1918.

(D) How Children were Selected.

In the selection of the children, those suffering from malnutrition, imperfect development, anaemia, scrofula, etc., were picked up.

Any one falling under any of the following heads was excluded:—

One affected with tuberculosis, trachoma, nephritis, *kakke* (a kind of beriberi), disorder of the heart, epilepsy, and any infectious diseases (including skin diseases), and a germ carrier (of typhoid fever and dysentery) and such others as are considered as unfit to live together with others.

For the selection of the children, the verdicts of the School physician were acted upon. At the same time, both blood-pigment and the quantity of blood-corpuscle were examined.

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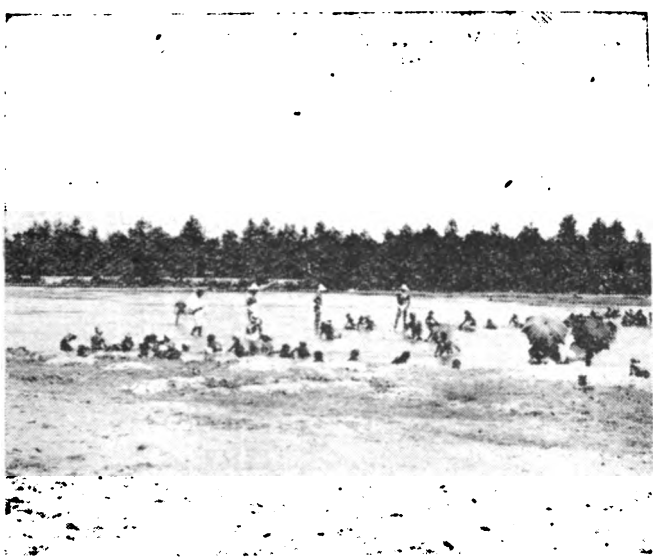
(E) Personal Effects of the Children.

In addition, the Primary Schools that sent their quotas of children provided blunkets, mosquito nets, wash basins, juvenile reading matter, and devices for innocent amusement.

a) Blankets, night gowns, pillows, and flannel belts.
b) Changes of garment and bath robes.
c) Towels, tooth-brushes, etc., and soap.
d) Articles needed for review work (as specified by the School).
e) Bowls for rice and bean soup (porcelain preferred to facilitate disinfection)
f) Caps and loin cloth.

(F) Meals and Refreshments.

It was desired to let the children take as much nutrition as circumstances permitted, in order to ensure good results, in conjunction with physical exercise and recuperation. However, the expenses had to be kept as low as possible, and for the present experiment, 30 sen a day each was fixed for the cost of the daily meals.



BATHING IN THE RIVER.

Besides the three daily meals, refreshments were served out once in the afternoon. In the preparation of the meals, the physician in attendance was consulted, and his suggestions were carried out as a rule.

(G) Items of Special Attention.

In order to attain the original aims of the enterprise, special attention was paid to the following:—

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a) The physician in attendance visited the lodgings and the bath-tank daily to watch over the conditions of the children. The nurses attached to the colony were in constant waiting.

b) On the first day of the opening of the colony and again on the day preceding its closing, Dr. M. Tsurumi (Superintendent of the S. M. R. Co. Sanitary Office and adviser to the colony) visited the colony to examine the children as to the undermentioned:—

1. Weight, stature, and girth of the chest.
2. Pulse and respiration while at rest.
3. Excrements (as to presence of any parasites) and urine (as to presence of albumen, cylinders, blood-corpuscles, etc.)
4. General condition of nutrition.

c) Matters of careful watching.

(Conjointly by the physician, teachers, and nurses.)

1. Weighing of the body (once a week)
2. Kinds of diseases, if any, during the colony period.
3. Condition of appetite, together with the working of the digestive organ.
4. Pulse, respiration, and fatigue, if any, before and after sundry exertions.
5. Any change in the behaviour of children of nervous temperament.

d) Points of observation for one year after the closing of the colony.

1. Weight, stature, and girth of the chest.
2. Pulse and respiration after sundry exertions; how long exertion can be continued, and what fatigue is shown.
3. Increase or decrease of the amount of food taken.
4. General condition of health, particularly as regards the digestive and respiratory organs and how often cold and some other illness is contracted.
5. Discipline regulating daily rising and retiring and other conducts of life.
6. Interest in studies, class-work showing, etc.

e) Each child was to enter the health diary as regards

Sleep, appetite, general condition of body, and mind, experiences, and impressions.

f) Six teachers took turns to be on duty daily, and each overseer entered the overseer's diary as regards

Weather; temperature; temperature of hot spring; temperature of river-water; bath hours; nap; refreshments; who have taken bath, and who have not; injured and sick, if any; how exercise has been carried on; how the children have conducted themselves at the lodgings; general review; remarks.

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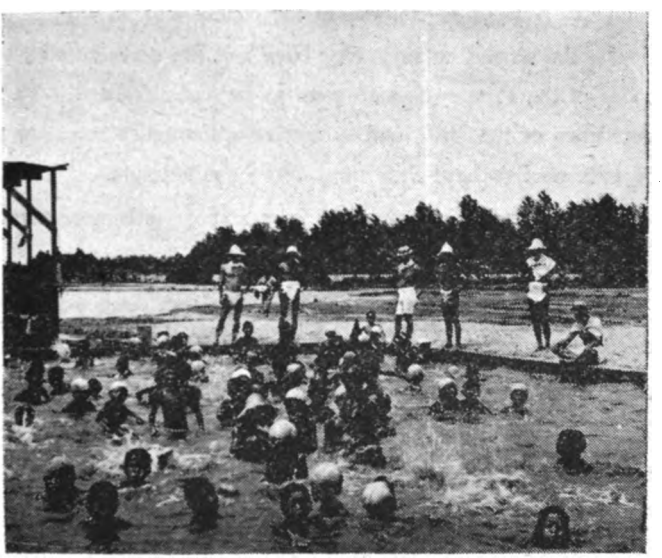
g) Both inside and outside the lodgings and their immediate environs were kept scrupulously clean, and any foul places were disinfected daily, so as to prevent the breeding of flies and the transmission of disease-germs.

h) The disinfection of table ware and kitchen utensils, and also the washing of the children's clothes were rigorously enforced.

i) Every care was taken to regulate daily life according to the plan; to nurture interest in living together; to cultivate habits of self-dependence; to conform to the approved code of manners; to enhance self respect.

In hot weather, the children were carried in donkey cars.

Two hours in the morning were set apart for hot bath, sand-bath, gamboling on the sandy bank, wading in the clear river, rambles in the grove, etc. After the noon-day meal, succeeded by nap, another portion of exercise was taken, and after refreshments at 4 p.m., the children returned home at 5 p.m.



"PLAYING THE DUCK" IN HOT SPRING BATH.

Some days were converted into these of amusements to give opportunities to the children coming from different schools, to know one another better.

Towards the close of the colony, a field day was held on the river bank, to let the children know themselves that they became capable of a good deal of bodily exertions.

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h) The staff of the colony was composed of the following:—

Dr. M. Tsurumi, Adviser; one superintendent; seven overseers; one physician, 1 clerk; 1 nurse; 1 laundress; 3 janitors.

i) The expenses required for the first experiment were ¥1,500.

II. Second Hot Spring Colony.

The second hot spring colony was opened on similar lines to the first. Only the number of the children increased, and it had some features different from its predecessor.

(A) Number of children in the colony and its term.

In the second colony, fifty boys and the same number of girls of the same grades of the Primary Schools were to be accommodated. The boys were to have precedence of the girls, and to receive a fortnight's care, on the expiry of which the girls were to have their turn, also for a fortnight.

After a careful choosing, 37 boys and 41 girls were admitted.

(B) Cost of food.

In the second colony, the cost of food per diem per capita was raised to 55 sen, because of the rise of prices, compared with the previous year. Moreover, the fare on the preceding occasion was felt somewhat to leave something to be desired in point of nutrition. Of the above daily food cost, 40 sen was borne by the children, the South Manchuria Railway Company supplying the balance of 15 sen.

III. Third Hot Spring Colony.

The points of dissimilarity from the preceding enterprises may be itematized under:—

(A) Number of children in the colony and its term.

This time 75 boys and as many girls were to be accommodated by turns also for two weeks as in the preceding case.

The actual numbers of children who joined the colony were 84 boys and 78 girls, totalling 162.

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(B) The daily food cost was further raised to 60 *sen* a day, of which 20 *sen* being defrayed by the Railway Company.

(C) The staff of the colony was organized much the same as on the two previous occasions, excepting that there were two nurses instead of one.

(D) Equipments,

The hot spring bath was enlarged. So was the sand bath, to 60 ft. by 30 ft. The rest-room, too, was extended to 30 *tsubo*.

(E) The expense list for the third colony was as follows:—

1.	Building work, etc.	Y2,126.25
2.	Travelling expenses	873.72
3.	Children s train fares	320.10
4.	Pays for nurses	204.80
5.	Medicines, etc.	14.40
6.	To make up deficit of food cost, etc.	882.87
7.	Sundries	376.10
	Total	4.798.15

IV. Results Attained.

As the effects of the hot spring colonies upon body and mind of the children accommodated require thorough and accurate observations, not only were the children's daily conditions closely watched, as already mentioned, by the physician and overseers, but also the reports on them after the children went back home were prepared by the Primary Schools each pupil belonged to, and moreover, the weight, stature, and girth of the chest

WRESTLING ON THE SANDS.

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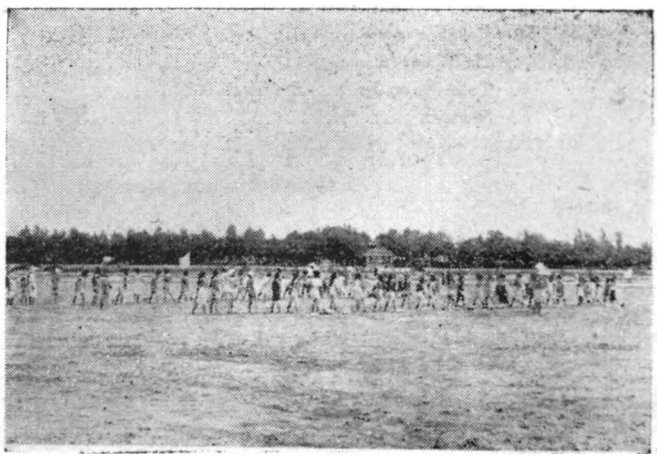
were measured at the end of four months and seven months from the close of the colony. In addition, the physical and mental conditions of the children, too, were included in these reports.

(A) Effects of Initial Colony.

a) As regards the health condition of the children, a marked improvement was noticed towards the close of the three weeks' term.

As the children were picked up from among the feeble element, the appearance of sick cases was at first feared, but this fear proved wholly groundless, which circumstance attests to the beneficial effect of the enterprise upon the children's health. Further, as it drew near the close, the children showed a liveliness and nimbleness in their movements, and also an increase in vitality was distinctly noted. At the same time, the appetite grew keener. In the earlier part of the colony, some of the children often left part of the repast laid before them, but even these, towards the close of the colony, complained of a wholesome hunger, and their portions had to be increased. The improvement of the faculty to assimilate the food testified to that of the health condition. Correspondingly, sleep crept up to them more softly and overtook many even before the hour of retirement. Many slept so soundly as not to be roused by the bell for rising.



EXERCISE ON THE SANDY BANK.
WHICH SIDE SENDS WATER MELON FASTER?

With the betterment of the physical condition, a salutary effect was produced also on the temperament and mind.

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Because of the original apprehension that the children might be prone to have the blues and might keep thinking of their sweet homes too deeply to enjoy their novel life among the comparative strangers, much ingenuity was brought to play to relieve the monotony of the daily routine at the colony with recreations, etc. At all events, the management had the satisfaction to note that the children took to the colony with a liveliness, and their cheerfulness never flagged.

Such results could be obtained by the domination of the active and cheerful spirit over the old habitual sluggishness, and also by the enhancement of self-respect.

(B) Weight of Body.

At the colony, the children were weighed once weekly, but below, the average of the weights obtained before and after the colony term and after four and seven months from the close of the term, together with the percentages of increase are given :—

First Hot Spring Colony.

	Age					
	11	12	13	14	16	
Number	4	9	6	3	1	23 total
	kuan	*kuan*	*kuan*	*kuan*	*kuan*	average
Before colony	6.518	6.521	6.982	6.900	8.200	—
Increase at close	0.085	0.100	0.004	0.062	0.250	0.089
After 4 months (in December) ...	0.476	0.346	0.724	0.865	0.550	0.544
After 3 months further (in March next year)	0.332	0.302	0.258	0.366	0.300	0.304
Total increase in 8 months	0.863	0.748	1.046	1.293	1.100	0.937
Increase rate of healthy children in 8 months	0.397	0.505	0.066	0.922	0.936	0.685
Extra increase in weight of colony children over healthy ones ...	0.466	0.243	0.380	0.371	0.164	0.252
Percentage of increase rate of colony children to that of healthy ones	2.17	1.43	1.57	1.40	1.18	1.36

The above weights indicate the averages among the children of the same age. More will be said in a general review later.

(C) Effect on body and mind.

The results of the reports sent in after seven months from the close of the colony term were as under :—

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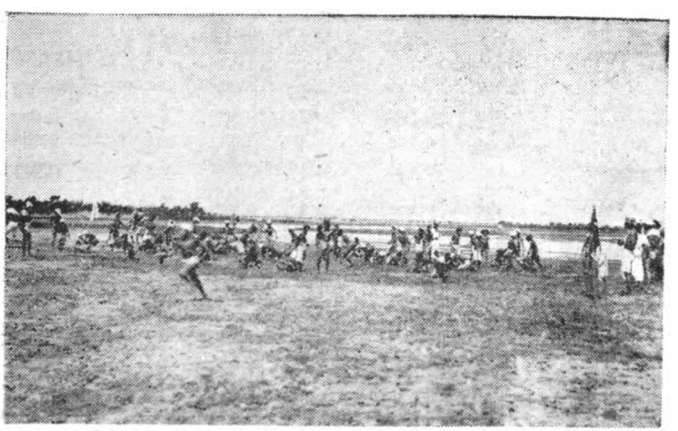
1) Continuation of exertions and fatigue condition
   - Those who grew in the power of resistance 18
   - Those in whom no perceptible change was observed for the better compared with before the colony 6
2) Assimilation of food.
   - Those who increased in faculty to assimilate food 19
   - Those who showed no sign of improvement 5
3) General health condition and susceptibility to illness
   - Such as became less susceptible to illness and such as recovered vigorous health and became immune to illness 20
   - Those who remained the same as formerly 4
4) Rising and retiring, and other daily routine
   - Such as became regular in the daily routine 19
   - The others who remained unchanged 5
5) Interest in studies, and class work showing
   - Those, who evinced greater interest in their studies and became better pupils 14
   - The others who remained the same 10

As may be seen from the above, the children who joined the hot spring colony derived benefit both physically and mentally. In appetite, some of them manifested so healthy an improvement as to astonish their home folk. Correspondingly, they increased in weight remarkably, and many, who used to be often afflicted with cold, stomach and bowel troubles, and to be compelled to absent themselves from school, could attend school regularly. One little boy, ten years old, was cured of bed-wetting.



"TREASURE HUNT."

The above mentioned improvements were observed not only in the latter part of the brief colony life, but lasted long after the colony was closed. This enterprise must certainly have done good in improving the constitution.

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Second Hot Spring Colony.

Under the above head, what is practically the same as on the preceding occasion is left out.

Below are given two tables, one each for the boys and girls, for the increase in weight, etc.

1) Boys.

	Age 9	10	11	12	
Number	14	8	3	1	Total 26 average
	kuan	*kuan*	*kuan*	*kuan*	
Weight before joining colony	6.300	5.990	6.063	6.920	—
Increase in weight at close	0.283	0.312	0.277	0.570	0.302
Further increase in December	0.263	0.232	—	0.620	0.235
Further increase in March next year	0.161	0.027	0.027	0.770	0.128
Total increase in 8 months	0.713	0.571	0.303	1.960	0.665
Increase in weight of healthy children in 8 months	0.346	0.397	0.505	0.666	0.479
Increase over ordinary increase in case of healthy children	0.367	0.174	decrease −0.202	1.294	0.186
Increase percentage for colony children over healthy ones.....	2.06	1.44	−1.67	2.79	1.39

2) Girls.

	Age 9	10	11	12	
Number	11	5	2	2	Total 20 average
	kuan	*kuan*	*kuan*	*kuan*	
Weight before joining colony	6.072	5.790	5.430	7.595	—
Increase in weight at close	0.267	0.392	0.545	0.820	0.381
Further increase in December	0.237	0.202	0.245	0.385	0.244
Further increase in March next year	0.160	0.052	—	0.165	0.117
Total increase in 8 months	0.647	0.647	0.790	1.370	0.742
Increase in weight of healthy children in 8 months	0.378	0.477	0.659	0.701	0.554
Increase over ordinary increase in case of healthy children	0.269	0.170	0.131	0.669	0.188
Increase percentage for colony children over healthy ones	1.71	1.36	1.20	1.95	1.34

As on the preceding occasion, the effect on the body and mind of the children was also favourable as may be tabulated under :—

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1) Continuation of exertions and fatigue condition.

Those who grew in the power of resistance 42
Others who remained the same 23

2) Assimilation of food.

Those who increased in faculty to assimilate food 51
Others who remained changeless... 14

3) General health condition and susceptibility to illness such as became less suceptible to illness, or was altogether free from illness and grew re-remarkably stronger 22
Such as made less progress 24
Others who remained changeless... 19

4) Rising and retiring, and other daily routine.

Such as became regular in their daily routine 44
Others who remained unchanged... 21

5) Interest in studies, and class-work showing.

Those who became better pupils 37
Others who remained the same 28

Third Hot Spring Colony.

The children joining the third hot spring colony gave far better results in weight as under :—

1) Boys.

	Age.				
	9	10	11	12	
Number	13	19	15	2	Total
	kuan	*kuan*	*kuan*	*kuan*	average
Weight before joining colony	5.905	6.338	8.043	8.401	—
Increase in weight at close	0.212	0.276	0.136	0.475	0.224
Further increase in December	0.188	0.318	0.411	0.550	0.321
Further increase in March next year	0.251	0.116	0.278	0.515	0.226
Total increase in 8 months	0.651	0.710	0.825	1.540	0.771
Increase in weight of healthy children in 8 months	0.346	0.397	0.505	0.666	0.479
Increase over ordinary increase in case of healthy children	0.305	0.313	0.320	0.874	0.302
Increase percentage for colony children over healthy ones.....	1.88	1.94	1.63	2.31	1.61

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2) Girls.

Number	Age. 9	10	11	12	Total average
	24	25	12	2	
	kuan	*kuan*	*kuan*	*kuan*	
Weight before joining colony	5.694	6.139	6.959	6.900	—
Increase in weight at close	0.106	0.141	0.252	0.075	0.147
Further increase in December	0.420	0.365	0.428	0.535	0.403
Further increase in March next year...	0.148	0.310	0.321	0.010	0.241
Total increase in 8 months	0.674	0.816	1.001	0.600	0.791
Increase in weight of healthy children in 8 months	0.378	0.477	0.659	0.701	0.554
Increase over ordinary increase in case of healthy children	0.296	0.339	0 342	−0.101	0.237
Increase percentage for colony children over healthy ones	1.78	1.71	1.52	−1.17	1.43

The beneficial effect on the body and mind of the children may be summarized as follow:—

1) Continuation of exertions and fatigue condition
   - Those who grew in the power of resistance 101
   - Others who remained the same 33

2) Assimilation of food
   - Those who increased in the faculty to assimilate food 51
   - Others who remained changeless... 40

3) General health condition and susceptibility to illness
   - Such as became less susceptible to illness, or was altogether free from illness and grew remarkably stronger 93
   - Others who remained unimproved 41

4) Rising and retiring, and other daily routine
   - Such as became regular in their daily routine 44
   - Others who remained unchanged... 48

5) Interest in studies, and class-work showing
   - Those who evinced deeper interest in their studies and became better pupils 87
   - Others who remained the same 47

It may be gathered from the above showings that the hot spring colony enterprises give beneficial effect to the improvement of the children's constitution. The marked margin between the increase of the weight of the colony children and that of healthy children who did not take part in the colony attests thereto. Of course the weight of the body varies more or less according to the time of weighing. But in the present cases, the hours of weighing were made uniform.

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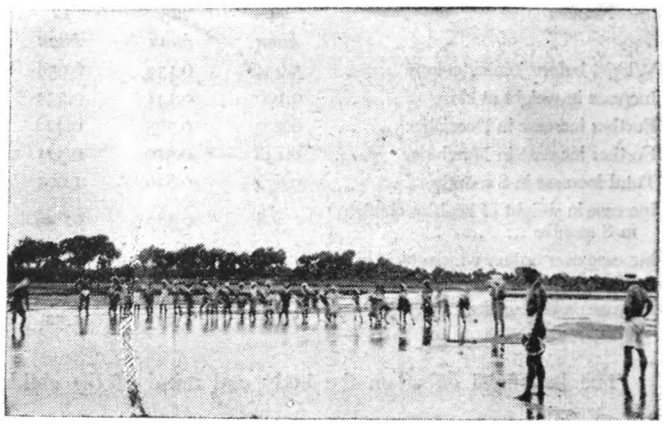
A brief review may be made on the rate of increase of the body, the sex, and the time which elapsed between two weighing operations.

Speaking of the first hot spring colony, regarding the 23 children whose progress after the close of the colony was carefully followed, the average increase in the course of the eight months was 0.937 *kuan*, as against 0.685 *kuan* for healthy children, the average difference in the former's favour being 0.252 *kuan*.



WADING ACROSS THE HSIUNGYO.

As regards the second colony, the average difference in favour of the boys numbering 26 was 0.180 *kuan*, and that in favour of the girls numbering 20 was 0.188 *kuan*.

The showings of the third colony were materially the same.

These give the difference in favour of the colony children over others who did not attend the colony between 40 and 100%.

Only, in the case of the second colony, the averages for the two 12 year boys and two 12 year old girls proved lower than the rate of increase for healthy children, but this was due to illness and other causes, and it should be regarded as an exception.

Relation between increase in weight and the ages.

According to the above tables, the rate of increase in weight tends to diminish as the children grow in age. In one instance, the 12 year old children showed an increase over 11 year ones, but there might be some hidden cause to account for it.

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Another table appended below will further go to confirm this line of argument. It may be inferred from this that the lower the age is, the more marked is the benefit.

The following is a table giving the respective rates of increase between the sexes. With one exception in the instance of 11 year old girls, the male sex gives a higer rate of increase than the female sex:—

Rates of Increase in Weight.

Of all children who joined in three colonies.

		Age 9	10	11	12	
	males	27	31	27	9	Total 94
	females	35	30	14	4	„ 83
		kuan	*kuan*	*kuan*	*kuan*	average
Increase of weight at close of colony	males	0.249	0.261	0.145	0.212	0.212
	females	0.157	0.183	0.294	0.448	0.203
Increase of weight in following December	males	0.227	0.413	0.344	0.684	0.353
	females	0.363	0.338	0.402	0.460	0.365
Increase of weight in following March	males	0.204	0.121	0.258	0.373	0.218
	females	0.152	0.267	0.321	0.088	0.211
Increase of weight in all 8 months	males	0.680	0.791	0.747	1.269	0.782
	females	0.672	0.788	1.017	0.996	0.779
Margin of increase for colony children over healthy ones	males	0.334	0.394	0.242	0.603	0.303
	females	0.294	0.311	0.358	0.295	0.225
Increase percentage for colony children over healthy ones	males	1.96	1.99	1.48	1.91	—
	females	1.78	1.65	1.54	1.42	—
Average increase percentage for both sexes		1.87	1.82	1.51	1.67	—

Whether or not the beneficial effect of the hot spring colonies on the increase in weight is only temporary or of a lasting nature cannot be argued here on the returns of one full year from the opening of the colony, but may be reviewed according to the showings given in the course of eight months.

It may be observed that, during the colony term which lasted only two weeks or three weeks, the average increase in weight was 0.200 *kuan*, whereas, in the course of the following four months up to December of the same year, the increase was only nearly 0.360 *kuan* or 0.090 *kuan* per month. This goes to show that the rate of increase was reduced gradually after the close of the colony. This decreasing tendency will be confirmed by the returns of the succeeding three

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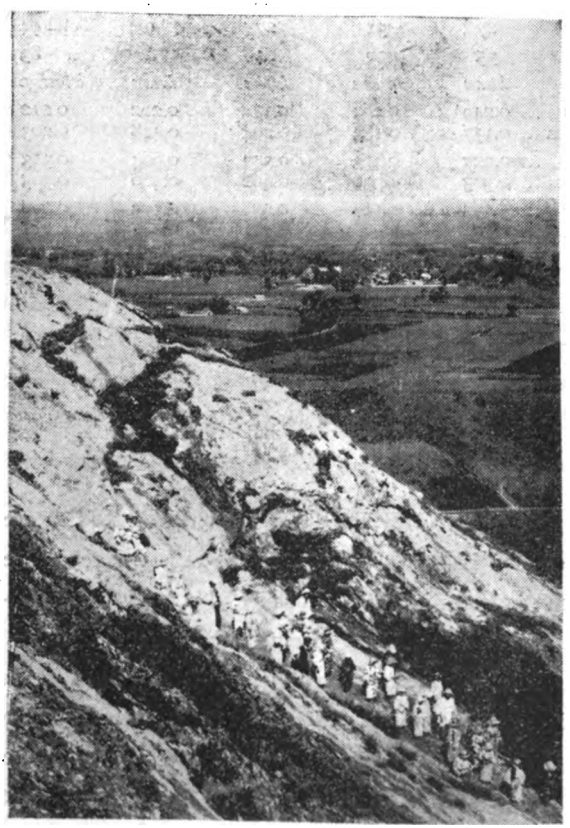
months, that is, up to March the following year, during which period the average increase was 0.210 *kuan* or 0.070 *kuan* per month.

We may deduce from the above that the increase in weight is maintained for a considerable period even after the close of the colony, although the rate of increase decreases as time goes by.

Conclusion.

In the hot spring colony, the greatest stress is laid on the improvement of het constitution.



CLIMB UP WANGHSIAO HILL.

To sum up the effects on both mind and body, the most remarkable improvements in the physical condition were observed in the increase of appetite and also of the weight. Comparing the rates of increase in the weight of the colony children in the course of eight months from the opening of the colony with the rates for healthy children who did not attend the colony, the excess increase in favour of the colony children was from 50% to 100%, the rates being higher as the children were younger. Between the male and female children, there was only a slight difference in the former's favour. Then, speaking constitutionally, the colony

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children showed themselves less susceptible to illness and also better equipped to withstand fatigue.

REST ON THE HILL.

Next, the feeble children, who used to be prone to be melancholy and sluggish, seem to have gone through an encouraging change to be livelier and more sociable. Moreover, they acquired a deeper interest in things, and this reacted favourably also on their class work. Last but not least, some idea of what it is to live together and to get on well in a large group was inculcated on the young mind.

"Present Manchuria and Mongolia."

In order to fill up some blank space at command, we shall give an up-to-date idea of what the so called Manchuria and Mongolia are like in a serial according to the "Present Manchuria and Mongolia," a pamphlet published by the South Manchuria Railway Company Industrial Office, Dairen.—Ed. *L. of M.*

SERIES I.

I. Geography.

GEOGRAPHICAL SCOPE. There is no definite boundary to the so called "Manchuria and Mongolia." What are often referred to as Japan's special privileges in Manchuria and Mongolia are embodied in the various Treaties, Protocols, etc., and actually allude to those in South Manchuria and the Eastern Part of Inner Mongolia.

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In the present case, North Manchuria, in addition, which, with South Manchuria, comprises the three Eastern Provinces, viz., Fengtien, Kirin, and Heilungkiang Provinces, along with the Liao Valley and the Eastern Part of Inner Mongolia in the lower Nen Valley.

ADMINISTRATIVE DISTRICTS. Manchuria, as above stated, consists of the three Provinces of Fengtien, Kirin, and Heilungkiang, subdivided into the following minor districts:—

Fengtien into 5 Tao (District Superintendencies) and 57 prefectures;
Kirin into 4 Tao (District Superintendencies) and 39 prefectures;
Heilungkiang into 3 Tao (District Superintendencies) and 31 prefectures.

Each Province has a Tuchun (Military Commander) to administer the military affairs and a Governor to look after the administration. Under the Governor, there are Taoyin (District Superintendents) and Prefects. The real political power is, however, held by the Military Commander.

Eastern Mongolia is divided into the four Tribes of Chelimu, Chasakotu, Chaowuta, and Hsilinkuoerh, which four Tribes are subdivided into thirty clans, each having a chieftain at the head.

The Mongolians being originally nomads, the waste land in their country are being reclaimed by Chinese settlers.

TOPOGRAPHY. The eastern part of Manchuria is mountainous, and borders on the Russian Littoral Provinces and Chosen by the Ussuri, the Tumen, the Changpai Range, and the Yalu. On the west, the vast level plain of Mongolia stretches afar to the horizon, part thereof being walled by the Hingan Range. On the north, it adjoins the Russian Amur Province across the Amur, whilst on the south the Yellow Sea and the Gulf of Pechili wash its shores. For some distance, it borders on China proper partitioned by the Grand Wall.

The Mongolian plain has undulations and contains deserts and alkaline belts.

In the line of rivers, there are the Liao and the Sungari with their tributaries, in addition to the famous Yalu and Tumen, the Muling, etc. The Valleys of these rivers are fertile, highly suited to cultivation. Even in the hilly regions, there is no small space of land admitting of reclamation.

AREAS & POPULATION. There are no ways of obtaining anything like accurate data about either land areas or population.

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According to the recent estimate of the South Manchuria Railway Company, the areas and population of Manchuria and the Eastern Part of Mongolia are as under:—

	Area squari *ri*	Population
Fengtien Province	15,151	11,979,400
Kirin Province	13,605	5,638,700
Heilungkiang Provice	35,497	2,494,000
Eastern Part of Inner Mongolia	10,168	4,366,000
Total	74,421	24,478,100

Remarks: 1 square *ri* is approximately 6½ square miles.

The above shows that Manchuria and the Eastern Part of Inner Mongolia are far larger in area than Japan, but has only one-third the latter's population. The average density of population is 330 per square *ri*.

In Fengtien Province, the land under cultivation reaches 60% of the arable land, and it has the highest density of population.

Manchuria is inhabited by Manchus and Chinese, and Mongolia by Mongolians and Chinese settlers. Besides, there are 600,000 Koreans and about a dozen hundred Russians, in addition to 200,000 Japanese.

Into North Manchuria and Inner Mongolia, Chinese farmers are immigrating in large numbers, and with the natural increase of population, the annual rate of increase is placed at between 400,000 and 500,000.

CLIMATE. The climate of Manchuria and the Eastern part of Inner Mongolia is what is called "continental" and have the extremes of heat and cold. People are apt to accept Manchuria as frigidly cold, often forgetting that its summer is intolerably hot. In summer, it is as hot in both South and North Manchuria as about Tokyo, Japan. This makes Manchuria a fine land for cultivation.

In rainfall, Manchuria has far less than Japan has. The average for Manchuria throughout the year is one-third of Japan's or about 600 millimetres, most of which is had in June, July, and August.

In the Mongolian plain, it is rather windy in spring. It may be regarded as a blessing by the farmers that no storm or torrential rain is known in autumn.

II. Agriculture.

RAILWAY & DEVELOPMENT OF AGRICULTURE. The climate of Man-

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churia and the Eastern Part of Inner Mongolia is adapted to agriculture. Its vast plain is covered with layers of loam, clay, and humus, rendering it one of the most fecund agricultural countries in the world.

The Chinese Eastern Railway, the South Manchuria Railway, and the Peking-Mukden Line of the Chinese Government Railways are carrying annually large numbers of immigrants and immense stocks of agricultural produce, quickening the development of agriculture in Manchuria in recent years.

Some people are found too often to jump to the wrong conception of Manchuria and the Eastern Part of Inner Mongolia to be only a broad expanse of raw sterile plain.

LAND UNDER CULTIVATION & NOT UNDER CULTIVATION. According to the recent investigations of the S. M. R. Co., the aggregate area under cultivation is about 39,100,000,000 *tsubo*. The portion for Manchuria is 32,510,400,000 *tsubo*, and that for the Eastern Part of Inner Mongolia some 7,692,000,000 *tsubo*. The arable land awaiting reclamation is put at about 30,000,000,000 *tsubo*, of which 80% lies in Heilungkiang Province. Then, what is reclaimed annually is supposed to range from 900,000,000 *tsubo* to 1,200,000,000 *tsubo*.

MANCHURIA ENLIGHTENING SOCIETY.

Whose Organ the "Light of Manchuria" is.

What actuates us in our endeavours to open up Manchuria and Mongolia lies in realizing our ultimate ideal in the enlightenment and development of Manchuria and Mongolia. It will not do only to develop the natural and industrial resources, but the ethical and intellectual culture of the inhabitants must also be carefully husbanded and nourished, so that both mind and matter may be developed in harmony.

The Manchuria Enlightening Society raised its first cry in order to fill a sorely felt need. Its primary mission is to investigate and propagate the truths of the development of Manchuria and Mongolia. We shall studiously refrain from misleading the public by disseminating inaccurate or exaggerated reports, but shall steadfastly adhere to the truth or facts only.

It is urgently important that the truths regarding Manchuria and Mongolia should be made known clearly not only to Japan and China, but also to Europe and America. On this account, the establishment of the Manchuria Enlightening Society is bound to have a serious significance of international character.

If happily, through the establishment and activity of this Society, the truths of the development of Manchuria and Mongolia should become topics of world wide interest, it would not be

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only an honour to those now actively engaged in developing these regions, but also a matter of congratulation to the world at large.

We might be permitted to add that the ultimate ideal and desire of this Society are to serve as the herald of all enlightening movements in future, thereby opening a new chapter in the annals of the world's civilization.

What is the Society Like.

a) Office.—The office of the Society is in the Municipal Office Building on Central Circle in the city of Dairen.

b) Society's Work.—The works of the Society include the following:—

1. Publication of the organ of the Society, The "Light of Manchuria."

2. Supply of general information through the Socitey and by other means, giving the results of such investigations and researches as may be conducted in the interest of the development of natural, industrial, and other resources in Manchuria, Mongolia, and Eastern Siberia.

3. To act as guide to intending investors in general in all kinds of enterprises in Manchuria, etc., and also to undertake any special investigation or research on application by promoters of all kinds.

4. To offer facility to travellers on inspecting visits to Manchuria, Mongolia, Siberia, Chosen (Korea), China, etc., to the end of importing accurate information and rendering their observations as close to truth as possible.

5. To use all kinds of means in order to propagate the true conditions obtaining in Manchuria, etc., and further to carry on the propaganda work for these regions through the medium of lecture meetings, exhibitions, etc.

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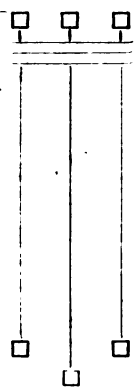

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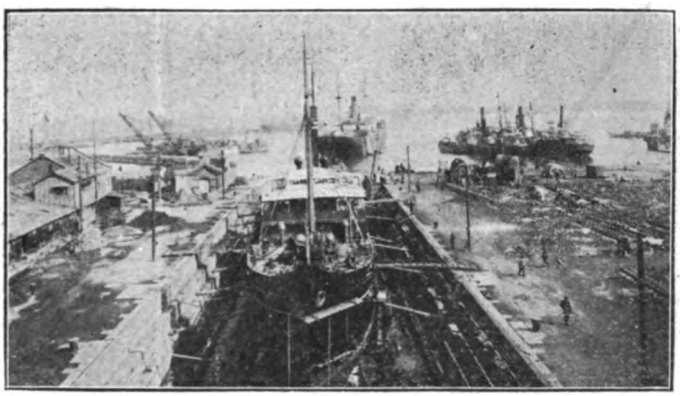

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LIGHT OF MANCHURIA

MANCHURIA-JAPAN TRADE AND JAPANESE CUSTOMS TARIFF.

By the S. M. R. Co. Economic Investigation & Statistical Office.

The question how far the division of labour will be commercially feasible in industrial lines between Manchuria and Japan depends in a large measure upon how heavy the burden of the Japanese customs tariff will be. Theoretically speaking, the customs barrier between the Kwantung Leased Territory and Japan might be wholly done away with. However, any such course would bring up a train of complicating issues. Therefore, this subject must be treated most carefully, and may be reserved for further study.

For immediate purposes, the kinds of staple exports from Manchuria to Japan, together with how they are treated industrially, will be taken up.

Under the present circumstances, Japan, for her closest relation to Manchuria both geographically and economically, occupies the foremost place in Manchurian trade. Granting that this state of things will continue, even in the event of a gradual development of various industries working upon staple products of Manchuria for raw material, the industrial division of labour, as above alluded to, would be difficult, unless Japan, the heaviest consumer of the Manchurian products, were put in a position to obtain them within easy reach by reason of a low customs tariff.

The following list gives upon what kinds of enterprises the industrial division of labour has a possibility of operating :—

1. Such industries as use Beans for raw material directly or indirectly.
2. Wild sericulture
3. Flour milling
4. Corn starch manufacture from maize and kaoliang
5. Iron industry
6. Manufacture of dye-stuffs, face powders, and paints
7. Paper milling
8. Woollen manufacture

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(I) Such Industries as use Beans for raw material directly or indirectly.

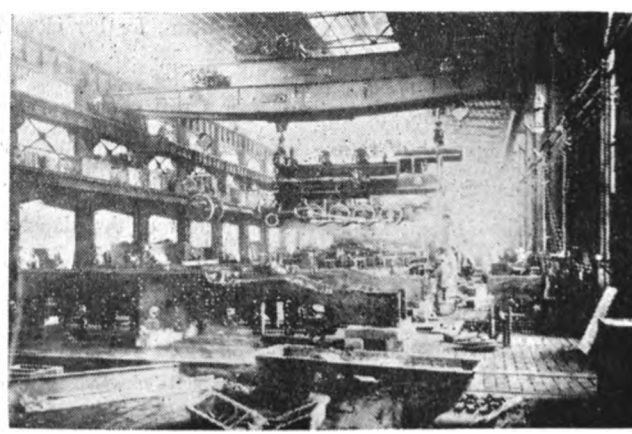
Manchurian Beans, which are the chief staple produce of Manchuria, are used extensively also in Japan for the manufacture of Bean Oil and Bean Cake.

In such case, the advantages accruing to the bean milling industry may be summed up as under:—

(a) Beans may be procured more profitably from Vladivostok than from Manchuria on the undermentioned grounds:—

	per American ton
via Vladivostok	
Harbin-Vladivostok freight, etc. (inclusive of all costs wanted till Beans are put on board steamer)	¥ 20.133
Vladivostok-Kobe steamer freight (by tramp vessel)	3.450
Total	23.583
via Dairen	
Harbin-Dairen railway freight, etc. (inclusive of all costs wanted till Beans are put on board steamer	26.308
Dairen-Kobe steamer freight (by tramp vessel)	2.250
Total	28.558
less the discount on Dairen-Changchun freight introduced on May 11, 1921	4.310
Total	24.248

From the above, it will be seen that, before the existing discount rate took effect, the Vladivostok route cost ¥4.975 per American ton less in freight and incidental expenses, and that, even after the discount was introduced, the difference in favour of the Vladivostok route is ¥0.765 per ton.



Erection Shop (South Manchuria Railway Workshops), Shahukou.

(b) **There is no risk to be run about the possible loss resulting from breakage of Bean Cake while in transit.**

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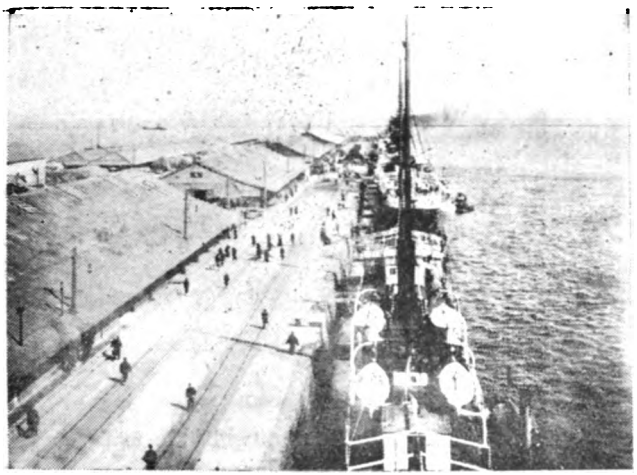
(c) The rather stiff Customs duty of ¥2.50 per 100 *kin* of Bean Oil (which has to be paid at the port of import in Japan on Bean Oil) may be saved.

On the other hand, such disadvantages as undermentioned attend the carrying-on of the undertaking in Japan :—

(a) Heavier cost of production required from the higher labour scales, etc.

(b) In place of the exemption from the import duty on Bean Oil at the port of import in Japan, the import duty on Beans imported must be borne.



Second Wharf (Dairen Wharves), Line of Breakwater seen just beyond.

If the aim of the bean milling industry were to turn out only Bean Oil and Bean Cake in Japan on the raw material imported from Manchuria, the cost involved by (b) above mentioned would tip the balance far beyond the margin of business workability. In plainer words, it would not pay to carry on such an industry on Beans imported from Manchuria.

The ratio of Bean Oil and Bean Cake to be put out from Beans is placed at 15% and 85%.

Supposing that 1,000,000 tons of Beans be imported to Japan in a year as bean milling material, the import duty on the Beans at the rate of ¥0.70 per 100 *kin* or ¥10.584 per ton of 1,512 *kin* would be ¥10,584,000.

On the other hand, if the same amount of Beans should be made into Bean Oil and Bean Cake and be imported into Japan as such, the import duty on Bean Oil at the rate of ¥2.50 per 100 *kin* and ¥37.80 per ton, would be ¥5,670,000 for 150,000 tons, whilst Bean Cake amounting to 850,000 tons would be imported duty-free.

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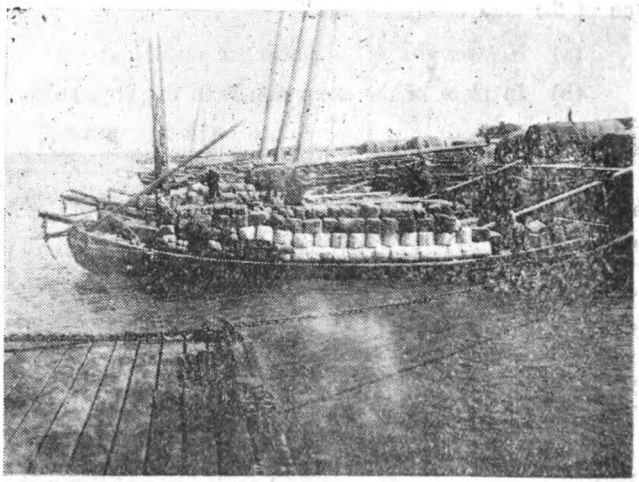
Thus, the difference in the latter's favour would be ¥4,914,000.

The chief disadvantage to the former is that in order to make Bean Cake, which is exempted from duty, Beans, a dutiable article, must be used.

Next, speaking of such industrial products obtainable from Bean Cake and Bean Oil as stearin, nitroglycerine, and solite, it would be out of the question for any imported articles to compete with the domestic products in Japan, simply because of the high protective tariff for the latter. Therefore, for any such industrial products, turned out in South Manchuria, markets will have to be sought in China or elsewhere.



Junks in Yingkou (Newchwang) Harbour.

When they come to be pitted against the Japan-made stocks on a foreign market, they will have the advantage of the lower cost of production.

Then, a question arises. For the same industrial products of South Manchuria, what will be the highest tariff in Japan that will still render them importable to Japan?

Before entering into this question, we will see what kinds of industrial products may be procured from Bean Cake and Bean Oil.

Bean Cake.

1) Manure, 2) Biscuits, 3) coffee, 4) washing powder, 5) *miso*, 6) *soy*, and 7) casein {from which last mentioned *tofu* (bean curd), several kinds of water paint, agglutinative, artificial leather, lustre-imparting agent to fabrics, and galalith (a substitute for India rubber, which may be used in making celluloid, etc.)}; and also 8) solite, which is used as paint for architectural purposes and also for dolls, as a substitute for pitch, as an insulator, shoe-blacking, and also to make an imitation ivory.

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Bean Oil.

(As food and a source of light).

1) Fatty acid ... ... → Tantalus (a water-proof); Olein; Soap

2) Faktis ... ... → water proof paint; eraser; chief ingredient for making smokeless powder

3) Hardened oil ... ... → stearin ... ... → candles; soap
→ butter
Nitroglycerine ... ... → explosives; smokeless powder

4) Glycerine ... ... → Pigments and seal pads; Lubricant; Toilette articles; Rolls (for printing); Medicinal and chemical substances

The above has given a list of products to be had from Bean Cake and Bean Oil. But, as the import tariff on the products as mentioned in Japan being necessarily high, such products will find it hard to compete with their kindred manufactures put out in Japan. However, in certain foreign countries in which like imports are taxed alike, the same advantage of the cheaper labour wages will remain.

In a sense, an industrial dawn is gleaming on South Manchuria, and the Japanese enterprises call for suitable encouragement and protection. The lower is the import tariff for these products in Japan, the better will the same enterprises be developed. Such is the hope of all those interested in industrial activities in South Manchuria.

Further, as the Japanese are no match for the Chinese in physical labour of unskilled category, skilled labour only may be imported from Japan. Therefore, the growth of industry in Manchuria forms one of the urgent problems in Japan's colonial policy, and a substantial reduction of the import tariff now obtaining on such staple products as are wrought from Beans, kaoliang, maize, etc., and also the products of wild sericulture, leather and hides, and iron and steel manufactures is desired.

II. Flour Milling.

The annual wheat crop in Manchuria may be roughly estimated at 6,000,000 *koku*. As a sequel to the European War, the universal shortage of wheat caused more than 300,000 tons of Manchurian wheat to be exported to Europe in 1920.

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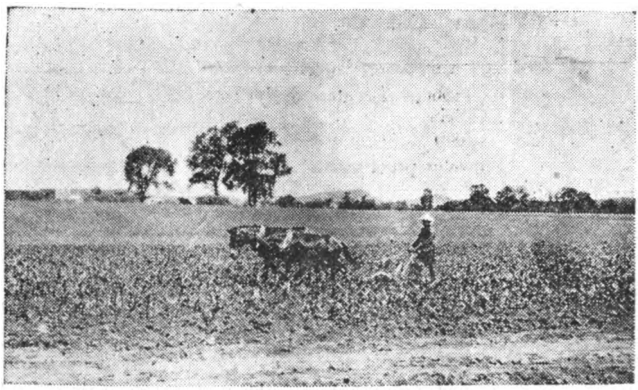

Maize Field in South Manchuria.

However, theexport of Manchurian wheat to Europe seems destined to cease as soon as the industrial reorgainzation is completed in Europe.

Moreover, of the wheat exported last year, some is cried as down not quite up to the mark in quality.

If there is only scant hope of exporting wheat abroad, flour milling industry may be developed so as to supply all the indigenous wants, and to export surplus stock, if any.

The following is a table showing export and import of flour from and to Manchuria :—

Flour.

	Export from South Manchuria		Import to South Manchuria	
	kin	value	*kin*	value
1916...	7,177,800	¥ 451,700	60,589,500	¥3,809,507
1917...	16,310,700	1,373,971	60,795,700	4,534,938
1918...	14,387,200	1,658,822	81,355,000	8,386,579
1919...	14,226,100	2,013,586	65,928,500	10,819,684
1920...	17,988,000	2,192,831	45,140,400	5,490,261

	Export from Shanghai		Import to Shanghai	
	kin	value	*kin*	value
1917... ...	...298,271,300	¥21,435,879	33,796,600	¥3,088,386
1918... ...	...442,893,100	42,430,212	28,592,500	3,169,763
1919... ...	...508,002,900	62,106,116	37,581,700	4,684,479

Remarks :—More than half the imports was re-exported to other China ports.

III. Corn Starch Industry.

Corn starch industry using for raw material kaoliang and maize in Manchuria

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is still in its infancy. There are indeed a few factories in existence, but none of them is worth mentioning specially. It is taken for granted that, by sensible fostering, it will develop into a promising industry in-as-much as a plentiful supply of raw material lies at command.

As to uses of corn starch, they are varied as food, starch for divers kinds of fabrics, etc.

IV. Wild Sericulture.

Wild sericultural industry ought to be capable of the industrial division of labour, but in Japan, the import duty on pongee is quite prohibitive, being ¥200 per 100 *kin*. As matters stand, there is not the slightest chance to compete with the kindred industry in Japan. As a manufacture (in the form of pongee), only the demands in Manchuria and China may be filled, and the product must be exported as tussah silk, a raw material, which is duty free in Japan. Such a high tariff may be necessary in order to protect the textile industry in Japan, where the textile tax is also very stiff. However, the wild sericultural industry of Manchuria, which has barely, as it were, lifted its head, will have to continue to leave Japan out of account as a market, much to the regret of those directly concerned in this line of the colonial enterprises.

V. Hide and Leather Industry.

The hides available in Manchuria and Inner Mongolia are those of horses, cattle, sheep, etc. The central market is Fengtien (Mukden). In outputs, a remarkable increase has been noted recently. The exports from Manchuria in 1919 amounted to ¥3,800,000. In 1920, the economic depression and other sundry causes have reduced the annual exports by nearly half to about ¥1,900,000. Of the above, what went to Japan was about ¥1,500,000 in 1919, and some ¥800,000 in 1920.

The leather industry carried on by the Japanese in Manchuria has been started fairly well on the road to steady growth.

However, the Japanese import tariff on leather and leather goods is as follow :—

(a) Leather.

Sole	¥15.20 per 100 *kin*.
Other kinds	20% *ad valorem*.

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Sheep's and Goats' skins.

1. Rolled leather ... ... ¥69 per 100 *kin.*
2. Other kinds ... ... 24 „

(b) Leather Goods.

Machinery belts and pipes ... ... ¥37.20 per 100 *kin.*
Linings for hats and caps ... ... 88.80 „

The above tariff may be called quite prohibitive. If large capital be at command from the outset sufficiently to make it possible to manufacture on an extensive scale, well and good. But, for anyone wishing to start with a small beginning to nurture the venture gradually, it would be next to impossible to seek a market in Japan. For reference sake, the export figures for Chinese hides, leather, skins, etc., from Tientsin and Hankow are given under:—

	From	
	Tientsin	Hankow
1917...	¥11,572,001	¥ 24,754,680
1918...	13,231,207	21,400,000
1919...	21,068,510	28,838,147

VI. Iron Industry.

The iron outputs of China at present may be placed in the neighbourhood of 400,000 tons or 500,000 tons. The steel works now in operation on a large scale are those at Hanyang, Tayeh, Anshan, and Penchihu (the two last mentioned being located in South Manchuria).

The latest enterprise is one taken in hand under Sino-British management and located at Chinwangtao. At this new steel works, the daily output from the blast furnace to be installed is put at 250 tons, and the plan is said to be in course of execution.

Also, at Lungyen Iron Mine near Kalgan in Chihli Province and at others in the Provinces of Shanhsi, Honan, Kiangsu, Anhui, and Kianghsi, there are said to be schemes of founding steel works on a considerable scale. At all events, the iron outputs of China have shown a tendency for steady increase.

Now the iron market has fallen, the import tariff on pig iron in Japan amounting to 8½ sen per 100 *kin* may be held as too heavy for the outputs of the Anzan Iron & Steel Works at Anshan.

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VII. Dyes, Face Powder, and Paints.

A dye-stuff industry founded on coal as indirect raw material has not yet grown up into one of importance. However, against a surplus supply of coal, the manufacture of tar, dyes, carbolic acid or phenol, and other kindred articles may be launched as a bye-industry.

Talc may be wrought upon for the manufacture of face powder, talcous powder, and paints. It is also good for a polish, a bleaching powder, an anti-friction, etc.

The vicinity of Tashihchiao Junction, wherefrom starts the Yingkou Branch Line on the South Manchuria Railway Main Line, is reputed to be one of the richest talc belts in the world. Moreover, in point of quality and price, the output beats Belgian and American products and now quite dominates the Japanese market, the demand therefor rising as its uses are becoming more varied and extensive.

VIII. Paper Milling.

The demand for paper increases in proportion to the advance of civilization and the growth of population. The manufacture of paper from pulp made from timber and kaoliang fibres is certainly promising in Manchuria which abounds in such raw materials.

In recent years, paper mills are springing up here and there, and China affords more than an ample market for all their products, and on this account, it will not clash with the like industry in Japan. Therefore, the comparatively stiff tariff in Japan will not stand in the way.

Kaoliang being harvested in South Manchuria.

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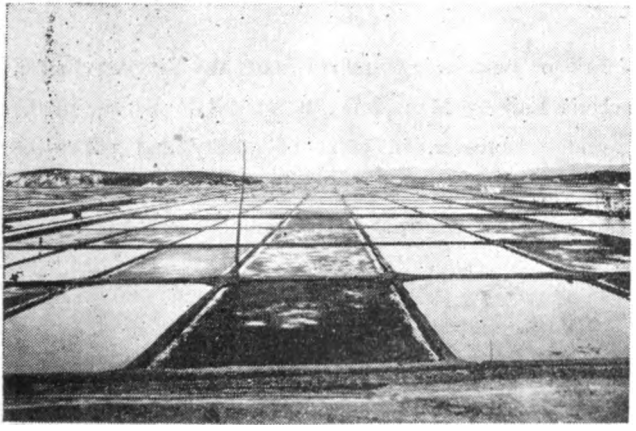
IX. Woollen Manufacture.

Woollen manufacture to be supported with wool produced in Manchuria and Mongolia requiring enormous capital, it had not been introduced into South Manchuria till recently when the Manchuria-Mongolia Woollen Manufacturing Co. was established at Fengtien (Mukden) in 1919, with a factory at the same place. It puts out woollen cloth of fair quality which has already exploited a promising market. So long as the present tariff holds in Japan, exportation to Japan is thought hopeless, and the management is understood to be planning to seek a market in Siberia.



Salt fields about Pulantien.

The demand for woolen cloth increases according as the standard of living rises.

The demand in Japan, too, has increased suddenly. In Japan, there are now woollen factories of decent dimensions, importing raw material from China and Australia. It would seem highly desirable to develop woollen manufacture in Manchuria to supply Japan. It is true that wool produced in North China and Mongolia is not so fine in quality as Australian wool, but the total products amount to some 30,000,000 piculs a year.

The Japanese import tariff on wool is as under:—

Woollen Yarn.

¥12 to ¥20.50 per 100 *kin*.

Woollen Cloth.

Woollen fabric ... ... ¥50-¥70 per 100 *kin*.
Woollen and cotton mixed fabric ... ... ¥22.50-¥55.00 per 100 *kin*.
Woollen and silk mixed fabric and woollen, cotton, and silk mixed fabric ... ... ¥120-¥188 per 100 *kin* or 40 *ad valorem*

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The above rates are decidedly stiff and might be materially reduced in order to leaven up the woollen industry in Manchuria.

Then, such industries as may be founded on Kwantung salt and natural soda of Mongolia may be tried as there is plenty of raw material obtainable.

In short, the above mentioned industries indigenous to Manchuria, which seem to permit of the industrial division of labour with Japan are, so to speak, only in their germinating stage, and await some effective encouragement. If a substantial reduction of the Customs tariff on those raw materials and products should be found impossible from Japan's protective policy, the sums of money corresponding to the import duties, or part of such duties on some specific articles designated specially for protective purposes may be granted to the producers as subsidy.

Principal Exports from Manchuria.

(via Dairen, Yingkou, Antung, and Tatungkou)

	With Import Duties in Japan.		
	kin	value	Import tariff in Japan per 100 *kin*
Beans	507,775,400	Y34,912,944	Yo.70
Other kinds of pulse	25,588,500	1,785,236	0.45
Bean Cake	1,731,174,600	93,124,439	duty-free
Bean Oil	27,446,900	5,600,217	2.50
Wheat	167,778,100	13,339,017	0.77
Kaoliang	25,370,400	13,413,870	0.35
Italian millet	7,044,800	550,894	0.50
Maize	3 710,100	223,841	0.30
Other cereals	9,461,500	508,818	0.40-0.55 & 15% *ad valorem.*
Sesamum	12,602,600	1,780,138	1.00
Other seeds	58,815,800	4,534,029	0.85-0.65; some duty-free; others 15% *ad valorem.*
Tussah silk	944,200	7,835,065	duty-free.
Pongee silk	—	541,698	200
Hides and Leather	—	785,169	duty-free or 20% *ad valorem.*
Bristles	1,800	4,274	duty-free.
Wool, Goat's hair, & Camel's hair	243,900	147,427	duty-free.
Animal's fat	34,900	9,936	0.80
Other kinds of fat	184,800	33,163	20% *ad valorem.*
Coal	171,200 tons.	3,785,417	duty-free.
Talc	—	159,520	duty-free.
Pig iron	35,971 tons.	4,191,870	0.085

Remarks: 1 Hk. tael has been converted to G.Y2.38.

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China's Trade with Foreign Countries.

in 1920 (Unit : Hk. Tl. 1,000)

	Total imports	Total exports	Excess imports	Excess exports
Hongkong	159,313	136,462	15,550	—
Macao	9,839	4,737	5,094	—
Singapore & Straits Settlements ...	7,803	16,539	—	9,083
Dutch East Indies	10,565	4,027	6,271	—
British India	32,494	8,758	23,145	—
Great Britain	131,720	45,805	84,161	—
Germany...	5,418	1,761	3,592	—
Holland	3,757	10,565	—	6,905
Belgium	4,970	3,273	1,670	—
France	4,879	21,016	—	16,294
Italy	342	5,518	—	5,206
Russia & Siberia	9,624	14,481	—	16,847
Chosen	10,314	23,346	—	14,740
Japan (inclusive of Formosa)... ...	229,136	141,928	79,316	—
Canada	20,182	1,039	19,114	—
United States (including Hawaii) ...	143,199	67,112	73,168	—
Other countries	16,404	35,264	—	21,388
Total	799,960	541,631	311,082	90,463
Re-exports abroad	37,710	—	—	—
Net total	762,250	630,809	220,619	—

"Present Manchuria and Mongolia."

SERIES II.

Continued from the September Number.

The principal agricultural products are as follow :—

(a) Beans.

Beans may be classified into Yellow (Soya) Bean, Blue Beans, and Black Beans. In fact, there are altogether more than two hundred species of Beans.

Yellow (Soya) Beans belong to the most common species. They contain a good percentage of oil and are also good as an article of food and also for the expression of oil.

The Manchurian (Soya) Beans have become widely known all over the world. Hitherto they used to be used by the Manchurian inhabitants as a food-stuff

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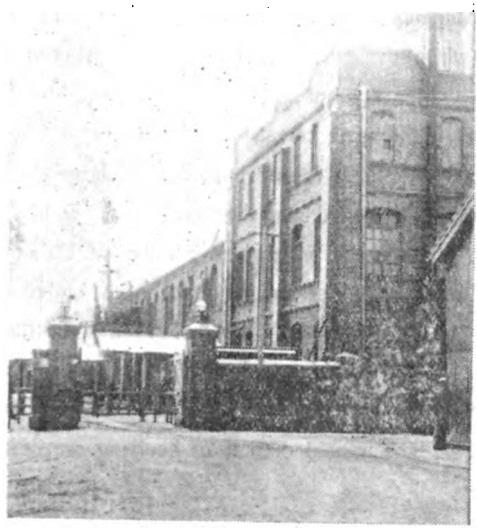
and for the expression of oil as a source of light. The residue left after oil was obtained served as a cattle feed.

Since the residue popularly known as Bean Cake came to awake demand in Japan as fertilizer, and Bean Oil began to be exported to the Western countries as industrial material, a marvellous development has been noted in the cultivation of Soya Bean. This belongs to only a recent date.

Bean milling industry, too, has correspondingly grown up, and along the South Manchuria Railway Lines, and especially at Dairen, there are a large number of bean mills on a considerable scale. The Beans, Bean Cake, and Bean Oil exported from the port of Dairen have reached 3,000,000 tons annually in recent years.

The Chinese not only use Beans and Bean Oil in their daily cooking, but also *tofu* (bean curd palatable also to the Western palate and pronounced by the qualified chemist as similar in its composition to cow's milk), *miso* (an article of the staple food to both Japanese and Chinese), and *soy* are also made from Beans.



East Asia Tobacco Co. Yingkou.

Bean Oil exported to the West is understood to be refined as substitute for cottonseed oil, peanut oil, linseed oil, etc., and even for animal fat. It can be made into soap, oleomargarine, and paint. New utilities are being invented for Beans and Bean Oil.

Beans put out in Manchuria and Mongolia are put at about 20,000,000 *koku* (*1 koku being equivalent to 4.96 bushels*), but the outputs are increasing rapidly year by year, and there is a vast area of territory awaiting cultivation.

The analyses of Bean Oil at different spots in Manchuria are as under, the average of ten samples being given :—

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At	Oil	Water
Harbin	17.77 %	11.90 %
Changchun	18.16 %	10.27 %
Kaiyuan	18.14 %	10.76 %

Next, the results of analyses of Beans of different kinds are as follow, the average of several samples being given :—

Beans	Crude oil	Albumen	Carbohydrate
Yellow (Soya)	11.78 %	16 92 %	14.99 %
Blue	37.32 %	37.62 %	38.65 %
Black	21.77 %	22.19 %	26.06 %

(b) Kaoliang.

Kaoliang is ubiquitous in Manchuria. It is grown most extensively and is the chief of the staple foodstuffs of the natives. For this reason, in North Manchuria, in which kaoliang is produced in less quantity than in South Manchuria (while the cultivation of wheat is incomparably larger), a restriction is put by common consent upon the amount of shumshu (a kind of alcoholic drink) distilled from the same cereal.

Kaoliang is first husked and cleaned before being cooked in the form of gruel or being boiled and then sun-dried. It is also used as fodder.

Recently, a Japanese resident at Dairen has hit upon a process by which a fair imitation of rice can be made from kaoliang in shape and taste.

As previously hinted, shumshu is distilled therefrom in large quantities.

The kaoliang stalk is used as fuel and a building material, and further matting is made therefrom. Its uses are varied as well as extensive.

The annual outputs of kaoliang are estimated at 36,000,000 *koku*.

(c) Italian Millet.

Italian millet, when cleaned, is called *hsiaomi* (small rice) by the Chinese. Its importance ranks only next kaoliang. An intoxicant known as *huangchu* (yellow drink) is brewed therefrom. It has divers species, and the tallest grows as high as from 6 to 7 feet.

The millet straw supplies the chief fodder for the domestic cattle, whilst the millet bran serves as hog feed. On this account, the millet, too, is raised everywhere, its yearly production being placed at 30,000,000 *koku*.

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(d) Maize.

Maize may be subdivided into three kinds—yellow, red, and a native breed called *laolaichou*. It is grown in the south of South Manchuria and also in part of North Manchuria and also forms an important article of food. In North Manchuria, an intoxicant is brewed from it. The stalks are used as an article of fuel whilst the leaves are good for fodder. The annual outputs are about 10,000,000 *koku*.

(e) Rice.

Rice is known as *tami* (large rice in distinction from *hsiaomi*, small rice or millet) among the Chinese. It is a valuable article of food too, to the Chinese peasantry. Upland rice, which is grown on dry farms, is produced to the extent of about 3,000,000 *koku*, and ordinary rice raised on paddy fields to the extent of about 500,000 *koku*, in both cases unhulled. It may be mentioned that the growing of ordinary rice has been undertaken in Manchuria only in recent years, and is therefore still produced to an inconsiderable amount. However, both soil and climate are well suited to its cultivation. The Korean settlers in Manchuria nearly monopolize the cultivation of this cereal. The amount of cultivation is expanding yearly at a rapid pace. The land area open to rice farming is estimated at 4,500,000,000 *tsubo* (1 *tsubo* being equivalent to 36 square feet).

Interior of East Asia Tobacco Factory, Yingkou.

(f) Other Crops.

Among other agricultural crops popularly grown may be enumerated red beans kidney beans, millet, wheat, cock's shin, buckwheat, oats, potatoes, etc.

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Next, as regards crops for special uses, hemp, flax, tobacco, sesamum, perilla, melon-seed, etc., are grown.

The hemp and flax crops are placed at some 40,000,000 *kin* a year. The tobacco is produced in Kirin Province to the annual amount of about 50,000,000 *kin*. Still, the supply being inadequate, about ¥6,000,000—7,000,000 worth is being imported yearly.

Next, turning to agricultural crops introduced lately, the sugar beet has been found to thrive excellently. The flax is looked upon in a similar light.

In the belt from the Kwantung Leased Territory up north to Mukden, the orchard industry is pronounced as promising. For instance, superior species of apples, pears, grapes, etc., are produced recently in increasing quantities.

METHOD OF CULTIVATION. Agriculture in Manchuria may appear crude to a casual eye, but when one looks deeper into its methods, one will easily find that what are in vogue are sensible devices adapted to climate and soil and developed through stages. In harrowing and ploughing, oxen, horses, and mules are employed to draw the ploughs and harrows, and rollers are brought to play in levelling work after the Western fashion. Domestic cattle are utilized to economize human labour, and in these respects, the Manchurian methods differ from the Japanese ways.

In fertilizing lines, droppings of the domestic animals and night soil are mixed with rich soil and are left in heaps, exposed to the weather for about three years. Chemical fertilizers still remain strangers to the native peasantry.

In dealing with the cereals, after they have been harvested, the grain is unhusked with the help of the domestic animals, and then it is packed in gunny or cotton bags to be carted to the market. The domestic animals are used also in cleaning the grain and in the home milling of flour.

Insects' ravages are considerable in some years, but the peasantry, whose heads are crammed with old superstitions, hold them as little short of a visitation and little trouble themselves with their extermination or prevention. Luckily, the happy climatic effects of Manchuria act fatally upon these insects, and it is through this natural boon that their harm is not more serious.

MANAGEMENT. Farming is carried on by the land-owners and the tenants. The tenancy system may be divided into three kinds, ordinary, profit sharing, and contract plans. In extensive farming, in some cases, over 300,000 *tsubo* of land

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is looked after by one single family. Those attending from 60,000 *tsubo* to 150,000 *tsubo* of land each are rated as farmers of intermediate class. The petty peasants have only 15,000-60,000 *tsubo* to till, and in many cases, not more than 4,000 or 6,000 *tsubo*.

Mules grazing on Lungshou (Dragon's Head) Hill, Tiehling.

Manchuria, there is an element that is termed as farming hands who are helpers immigrating into Manchuria from Shantung, etc., which are more densely populated.

AGRICULTURAL INSTALLATIONS. In lines of agricultural installations, the Chinese authorities maintain agricultural experimental stations at Fengtien (Mukden), Kirin, and Tsitsihar.

The South Manchuria Railway Company, having recognized early the urgent necessity to improve and advance the agricultural methods in the development of Manchuria and Mongolia, has founded an experimental station at Kungchuling and Hsiungyocheng each at enormous outlay, and has been carrying on the investigation and experiments of agricultural methods, stock farming, and afforestation.

An experimental station for the cultivation of the tobacco has been opened at Telissu between Wafangtien and Hsiungyocheng.

In addition, minor experimental stations are maintained at Chengchiatun on the Ssupingkai-Taonan Line of the Chinese Government Railways.

At the Kungchuling Station, such crops comparatively new in South Manchuria as sugar beets, tobacco, flax, etc., are being experimentally raised, while the improvement of the Bean breed has been receiving special attention. The Stock-farming Division has conceived the idea of improving the sheep breed, and incidentally the hog breed.

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At the Hsiungyocheng Station, sericultural industry, fruit raising, horticulture, and afforestation have been studied.

These investigations and experiments are expected to bring in important results to the agricultural Manchuria.

III. Stock-Farming.

STOCK-FARMING COUNTRY. The Japanese farmers are short even of cattle for use in the field. Therefore, Japanese agriculture is often referred to as "agriculture without animal help." In striking contrast with this state of things, in Manchuria, stock farming is indeed almost universal among the farming classes, and few farming houses are met with that do not keep at least three or four heads of cattle, horses, mules, etc., and some pigs and poultry, into the bargain.

It may be said that the Chinese are not always more attached to stock-farming than the Japanese, but they beat the Japanese hollow in the knack of domesticating and training the domestic cattle. Five or six head of cattle, horses, mules, or donkeys are hitched up at random to a heavily-loaded cart, and this motley team is managed with admirable dexterity by a Chinese driver with the cracks of whip in hand.

Larch Forest in Mengkiang Prefecture, Kirin Province.

As to the Mongolians, they are nomads, and the live stock serves as the only means of sustenance to them. In other words, they keep live stock consisting of cattle, horses, sheep, etc., and lead a nomadic life from place to place.

We shall now give a resume of the stock farming in Manchuria.

(a) Horses.

Manchuria and Mongolia are what has been referred to from old times in China as the finest horse breeding centre. The

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horses all belong to the Mongolian breeds. They stand 4½ ft. and 4.75 ft. long, weighing 583 lbs. on an average. They are rather undersized but well proportioned. They are built very strong and are used to coarse feed, neglect, and even exposure; moreover they have endurance to a wonderful degree. In ordinary circumstances, those that can pace are used for riding purposes, and the others as draught animals.

According to the latest returns prepared by the South Manchuria Railway Company, the horses in Manchuria and Inner Mongolia number about 2,500,000 head, comprising 750,000 head in Fengtien Province, 500,000 head in Kirin Province, 510,000 head in Heilungkiang Province, and 810,000 head in the Eastern Part of Inner Mongolia.

(b) Mules.

The mule is the cross breed between the she-donkey and the he-horse. It has existed in Europe and China from early times, but has been unknown in Japan. In size, the mule varies according to the sizes of its parent-animals, but is, in many cases, larger than the horse. This is because the he-donkey used for breeding purposes is what is known as the larger donkey, standing from 4 ft. 7 in. to over 5 ft.

Forest of broad leaved trees in Mengkiang Prefecture, Kirin Province.

The mule is employed in both farming and transport. It has great endurance and is inured to hard labour of a long duration, ill-fed and ill-sheltered. It costs dearer than the horse.

There are 200,000 head thereof in Fengtien Province, 230,000 head in Kirin Province, 120,000 head in Heilungkiang Province, and 70,000 head in the Eastern Part of Inner Mongolia, totalling 630,000 head.

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(c) Donkeys.

What belongs to the class of smaller donkeys is commonly kept in the native households. One stands only about 3 ft. It is strong of body and thrives on coarse feed. Its bearing strength is great for its size, and this makes it suited to agricultural, domestic, and transport uses. Some 500,000 head thereof are in South Manchuria and about 100,000 head more in the Eastern Part of Inner Mongolia.

(d) Cattle.

The cattle in South Manchuria, etc., belong to the Korean, Shantung, Manchurian, and Mongolian breeds. The first mentioned two breeds are comparatively small in number, the last mentioned two constituting the majority.

The Chinese keep cattle to work them, and the Mongolians for the milk they yield, the beef being regarded as bye-product.

The cattle in South Manchuria and Inner Mongolia are defectively developed in hinderpart and are rather inferior in all economic efficiency. But these drawbacks are made up by their power of endurance and docility, and that of withstanding neglect and exposure, which qualifications all go to befit them for hard labour. In weight, the heaviest weigh 1,166 lbs., those weighing 666 lbs. being most common. Accordingly, they give a comparatively meagre amount of beef. In quality, the native breed is classed below the Korean and Shantung breeds, and gives only a stinted amount of milk. There is ample room for future improvement with the cattle as with the horse.

The cattle in Fengtien, Kirin, Heilungkiang, and the Eastern Part of Inner Mongolia are put at 580,000 head, 90,000 head, 210,000 head, and 1,120,000 head respectively, making the grand total of over 2,000,000 head.

In the Eastern Part of Inner Mongolia, cowhides are put out in a considerable quantity, but owing to their poor quality and also the parasitic worm that eats out many holes in important parts, they have but an insignificant value.

(e) Camel.

The camel is found only in Mongolia. It is double-humped and stands 5½ ft. usually. It withstands the cold and is adapted to hard labour and is good to ride on. For this reason, it is an important medium of travel in Mongolia. Its number is put at about 4,000.

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(f) Sheep and Goats.

The sheep and goats are of Mongolian breeds. Hitherto they have been raised chiefly for their meat and skins, and the wool have been regarded as but a bye-product.

The ewe weighs from 58 lbs. to 83 lbs.; the ram weighs about 125 lbs. at the outside. One of its characteristics lies in storing nutrition in the fat rump.

Goats are a little smaller in size than sheep. They yield only a small quantity of wool.

The sheep gives not more than 3 lbs. of wool each of a quality far from passable. Most of it has been exported to the United States.

On the other hand, the goats's hair is of finer quality, but is a matter of only a little more than 1 lb. per head.

With the recent development of woollen industry in Japan, both wool and goat's hair have begun to be exported to Japan in a considerable quantity.

In South Manchuria, goat-raising takes precedence of sheep farming among the Chinese. In Mongolia, the natives attach the highest importance to sheep-raising. In both cases, more or less mixed farming is in vogue. To the Chinese, sheep- and goat-raising is only a secondary occupation, but to the Mongolians, live stock forms the principal property asset and the chief item of sustenance.

Judging by the outputs of wool and goat's hair, both sheep and goats combined are put at 400,000 head, 100,000 head, 60,000 head, and 2,000,000 head in Fengtien, Kirin, and Heilungkiang Provinces and the Eastern Part of Inner Mongolia respectively, making the total of 2,660,000 head

Sheep grazing (S. M. R. Co. Agricultural Experimental Station, Kungchuling).

Seen from the traditional aims of

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sheep- and goat-farming more for the sake of the meat than for the wool, no improvement seems necessary, but since the greater utility of wool than the meat tself became more widely known, the benefit of a systematic improvement on scientific lines has come to be noted more keenly.

(g) Pigs.

Pork is accepted by common consent by the Chinese as the most palatable. Hogs are kept at every farm house from a few to a dozen head. The grounds and waste put out from the shumshu distilleries, flour mills, bean curd manufacturers', etc., are used for pig-feed.

A rough calculation of the total number of pigs names 3,550,000 head for Fengtien Province, 1,250,000 head for Kirin Province, 490,000 head for Heilungkiang Province, and roughly 1,000,000 head for the Eastern Parts of Inner Mongolia, the grand total being placed in the neighbourhood of 6,690,000 head.

In Manchuria, there are three classes of the pig. One kind is larger-sized and weighs some 292 lbs. when 2½ years old; another kind grows to weigh 150 lbs. when a year old, and is known as smaller-sized; the other is medium-sized. Each kind breeds fast, and brings forth a litter of young numbering from ten to twenty at a time. The pig's hair is coarse and long and is known as bristle, being a product of no mean importance. Bristle is exported abroad to be made into brushes. Most of it goes to Osaka, Japan.

HOW DOMESTIC ANIMALS ARE TENDED. As stated previously, the domestic animals raised by the natives receive but a nominal amount of attention. Cattle other than milch cows, horses, and mules are kept either in roughly-made sheds or in the open yard. Millet straw is generally used for feed and is often given, mixed with maize stalks, straw, bean stems, and grass. For richer feed, kaoliang, bean cake, wheat bran, etc., are added.

The Mongolians never build stalls or other shelter for their domestic animals, but leave them to look after themselves.

Some Chinese furnish shelter, but seldom provide for bedding.

Pigs kept by the Chinese farmers are let loose in the day-time, and are put in the pen at night. The sight of lively pigs frisking after feed in the field after the crops have been harvested is one of the quiet rustic scenes in Manchuria. In

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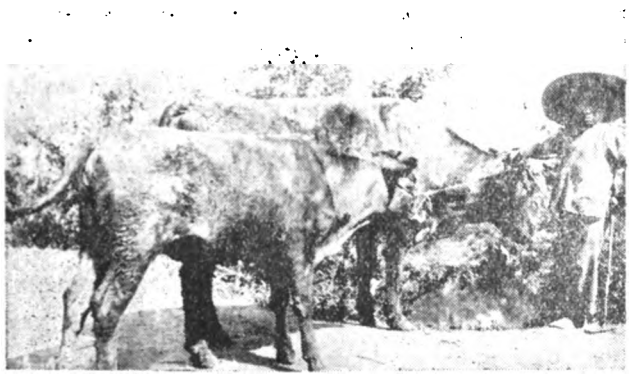
winter, pigs are sometimes fed on hay laid by for them, but in the majority of cases, they are left to themselves to pick up feed.

The Mongolians seek lowlands in summer for water for their sheep, and in winter get behind the hills for shelter from the piercing wind.



Mongolian Cow and Calf.

The sheep's skins clothe the Mongolians; their milk and meat serve as staple food-stuffs; and the wool is used to cover the huts and keep off the draught. Sheep to the Mongolians supply clothes, food, and shelter.

EXPORTS OF STOCK-FARMING PRODUCTS. As already stated, Manchuria and Mongolia abound in domestic animals, and wool, hides and leather, animals' bones, bristles, cheese, and other dairy products are put out in a great variety and quantity. But, the methods of production remain all primitive and none of them have yet developed beyond the stage of a domestic industry. There is plenty of room for future development in this direction.

The following are the exports from Manchuria during 1918:—

	Tael
Domestic animals, including cattle, horses, mules, pigs, sheep, etc.	527,825
Wool, goats' hair, etc.	461 131
Bristle and horses' hair	353,309
Leather and hides and manufactures	787 099
Eggs	143,710
Animal oils	461,895
Animal's bones	129,367

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IV. Forestry.

DISPOSITION OF FORESTS. In South Manchuria, the foot of the Changpai Mountains along the upper reaches of the Sungari, the Mutan, and the Tumen, and also the upper parts of the Yalu and the Hun are densely wooded; while in North Manchuria, the districts about Hailin on the Eastern Section (between Harbin and Pogranichnaya) of the Chinese Eastern Railway and about Sansing in Kirin Province are the principal forest lands.

On the other hand, Mongolia is a vast plain consisting of level land grown with grass and dotted with dunes. Nothing like a forest can be seen. Only amongst the Hingan Range and the Yinshan Range, there are believed to be some forests worth tapping, but no definite data are obtainable.

PRINCIPAL KINDS OF TREES AND THEIR PERCENTAGES. So far about 300 kinds of trees are known in Manchuria and Mongolia, but the principal kinds number about twenty.

All the forests and woods being natural ones, the percentages of the different kinds of trees are subject to variance, but the conifers and the broad-leaved trees may be approximately placed at the respective rates of 40% and 60%.

Of the conifers, the L. d. var. principis-rupprechtii R. et W. takes up the major portion; the A. nephrolepis, the P. hondœnsis Mayr., and kindred kinds 30%, the minor remainder being divided among the rest.

Of the broad-leaved trees, the Q. Fabri Hance, Mongolian oak, T. Koreana Nakai, elm, poplar, and their kindreds occupy some 70%, the walnut, Phellodendron amurense Rupr., and such like being found in a meagre quantity.

In the forests of the Hingan Range in the west of Heilungkiang Province and in the north of Mongolia, the L. d. var. principis-rupprechtii R. et W., P. silvestris L., and B. japonica Sieb. (B. alba L. var. vulgaris D. C.), predominate, and there are found only few kinds of superior trees.

FOREST AREAS AND ASSETS. In absence of reliable data, nothing definite can be set down, but from all reports available, the forest areas and their assets in Manchuria for 1918 may be roughly as follow:—

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a) On the right bank of the Yalu and along the Hun River; 2,004,000,000 *tsubo* with 347,655,000 *koku* of timber, @ 520 *koku* per 9,000 *tsubo*.

b) On the upper parts of the Sungari, the Mutan, and the Tumen excluding such localities as have only a few hundred *koku* of timber (according to the investigations of the S. M. R. Co.); 5,892,000,000 *tsubo* with 1,315,519,000 *koku* of timber, @ 670 *koku* per 9,000 *tsubo*.

c) Along the Eastern Section (between Harbin and Pogranichnaya); 7,305,000,000 *tsubo* with 924,696,000 *koku* of timber, @ 380 *koku* per 9,000 *tsubo*.

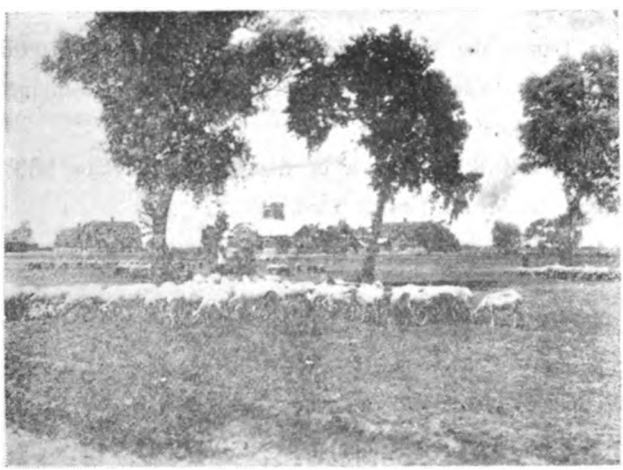
d) About Sansing district; 15,873,000,000 *tsubo* with 2,618,602 000 *koku*, @ 495 *koku* per 9,000 *tsubo*.

e) As to the forests in and about the Hingan Range, no data can be obtained, except that in the district within the radius of about 30 miles around Horgo and Hingan Stations for the centres, the average timber asset is put at about 450 *koku* per 9,000 *tsubo*.

Remarks: 1 *koku* is equivalent to 20 cubic feet.

TIMBER INDUSTRY. The timber industry of Manchuria and Mongolia may be practically merged into the felling and utilizing of conifers. A great deal is exported Tientsin way as building material, but what is used for making coffins goes up to a considerable amount.

As to the utility of broad-leaved trees, they are used for railway sleepers, mine timber, and firewood, and for the making of charcoal, and little of them is employed for other industrial purposes.



(Agricultural Experimental Station, Kungchuling).

As timber markets, Kirin and Antung come foremost, followed by such consuming centres as Harbin, Changchun, Fengtien (Mukden), Dairen, etc. At Antung the Yalu Timber Company under Sino-Japanese joint management is located.

Kirin has been a well-known timber centre from old times. At present there are divers Japanese and Chinese organizations engaged in putting out timber.

Next, along the Eastern Section of the Chinese Eastern Railway, the Railway

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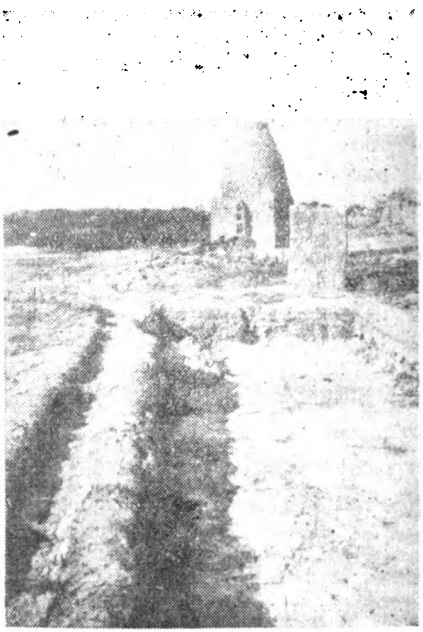
Management and Russians and Chinese have had railway sidings built to their lumber yards and are carrying on timber industry, including the operation of saw mills.

With regard to transportation, both Kirin and Yalu timbers are carried down the Rivers, whilst North Manchurian outputs are transported by railway. North Manchurian timber is usually 21 ft. in length, and Kirin timber is rafted down the stream in logs, the usual lengths being 15 ft. and 24 ft. As regards Antung lumber, ordinarily it is rafted down with two sides thereof stripped of the bark and roughly 16 ft. and 24 ft. lengths are most common.



Crude Soda Depot, Inner Mongolia.

TIMBER DEALERS. In Dairen the leading timber dealers include the Mitsui Bussan Kaisha, Ryoto Timber Co., Yamaha Yoko, Dairen Timber Co., Kwantung Timber Co., the Branch of the Akita Shokai, etc.

There are at Fengtien (Mukden) the branch of the Yalu Seizai (Saw Mill) Co. that of the Akita Shokai, the Mitsui Timber Yard, etc.

The chief dealers at Changchun include the Manchuria Timber Co., Changchun Saw Mill, etc.

At Kirin, there are the Mitsui Bussan Kaisha, Kirin Timber Co., the branch of Yalu Saw Mill, etc.

At Antung, there are, in addition to the Yalu Timber Co., Yalu Saw Mill, East Asia Timber Co., Antung Saw Mill, Antung Timber Co, etc.

FORESTS AND THEIR POLITICAL BEARINGS. In order to attend to the affairs concerning the forests, the Provincial Government of Manchuria have each the Board of Foresty which issues laws, regulations, etc. However, the foresty administration exists only in name, and forest fires, reckless disforesting, illicit disforesting, etc., occur in succession, and the depletion of the forests is growing worse year after

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year. It is partially because of the inadequacy of the Chinese police force and the bold operations of the brigandage, which render the steady exploitation of the forestry assests impossible. The high taxation in force on the forests, which are looked upon by the Government as an elastic source of revenue, is also answerable for the yearly deforestation in a measure.

Tussah Silk Weaving Factory, South Manchuria.

Apart from the Kwantung Leades Territory, all along the South Manchuria Railways, the hills have become bared of trees for the most part. This is highly regrettable not only from a forestry point of view, but from several other considerations.

Only, it is gratifying to hear that the question of afforestation is beginning to interest the Chinese officialdom and people as well.

The South Manchuria Railway Company has been distributing gratis yearly saplings of different kinds to the Chinese applicants.

V. Marine Products.

The Kwantung Leased Territory has only short coast lines. Still the Yellow Sea and the Gulf of Pechili abound in fish of all kinds, and fishery industry is being carried on on an extensive scale.

However, outside the Kwantung Leased Territory, there are no reliable statistics available.

The more important kinds of marine products found in the Kwantung coast waters include following:—

Tai, cod, sword fish, *guchi*, sawara, sole, flounders, *suzuki*, shark, *nibe*, sardines, *shirasu*, cattlefish, octopi, sea-slug, oysters, earfish, prawns, lobsters, crabs, whales, seals, etc.

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FISHERMEN IN KWANTUNG LEASED TERRITORY. The fishermen in the Kwantung Leased Territory are either Japanese or Chinese. The Japanese fishermen come from such Prefectures in Japanese as Yehime, Kumamoto, Kagawa, Oita, Hiroshima, Okayama, etc. They usually come over from Japan in spring and go home late in autumn. There are about 200 odd fishing boats with some 1,500 fishermen, against about 16,000 Chinese fishermen.

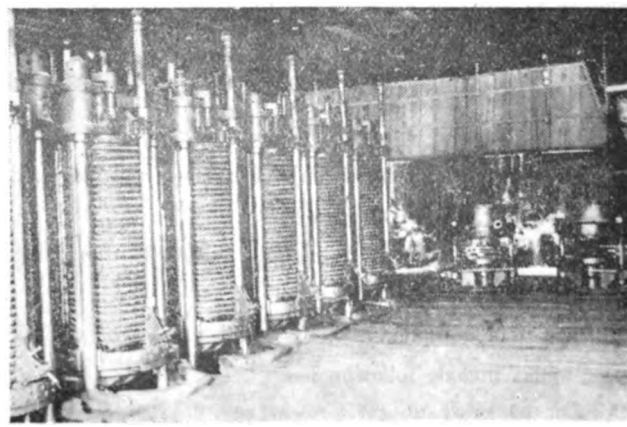
The chief hauls made by the Japanese are *tai*, and those by the Chinese are cod, *guchi*, and swordfish.

The following are the figures for the past three years:—

	lbs.	
1917...	25,135,150	¥1,187,755
1918...	25,631,675	1,617,493
1919...	26,995,575	2,550,924

The whale-fishery about Haiyangtao Island, near which the naval battle took place in the Sino-Japanese War, is undertaken almost exclusively by the Oriental Whale Fishery Co. Few Chinese are interested therein. The catches are forwarded Shimonoseki way. Seals are captured on the ice-floes when the ice in the coast-waters break up on the return of spring in the north of the Yellow Sea and also in the north of the Gulf of Pechili. The annual hauls range between 700 and 800 head, and sometimes over 1,000 head.

MARINE PRODUCT INDUSTRY. The marine product industry still toddles in its infancy. Cod, *guchi*, mackerel, *nibe*, flounders, etc., are salted, and sea-slug, ear-fish, jelly-fish, shell-ligament, etc., are subjected to some preservation process by the Chinese Some Japanese are turning out dried cod, and also working upon *tai* fish, but neither is worth mentioning.



Interior of Bean Mill (Beans under pressure), Dairen.

FRESH WATER FISHERY. The rivers, lakes, and other

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bodies of water inland also abound with fresh water fish.

In the Yalu, the part about Antung affords a good fishing ground. In the Sungari, the parts about Wulakai on the Upper reaches, about Sanchiakou, and farther below about Sansing are the most fruitful grounds. The lake in Hulun is one of the newest grounds.

Beans stored in matting bins.

Among the fresh water fish, the carp, gibel, trout, salmon, wels, *suzuki*, *tanago*, *yamame*, *higai*, river-shark, etc., may be counted.

In summer, the catches are carried to the market, and in winter, they are forwarded even into the interior of Siberia.

The main and branch streams of the Sungari are known as pearl grounds, and a good deal is still being put out.

SALT INDUSTRY. Over the Yellow Sea and the Gulf of Pechili, there is little rain and the evaporation process goes on actively. Therefore, the sea water is brinier, and salt manufacture is conducted very extensively along the sea coasts. Along those of Yingkou, Kaiping, and Fuchou, the salt gardens under management of Chinese Government and private parties lie in almost an unbroken line. The sea water is put in the salt gardens by making use of the tide and wind-mills, and is left to evaporation by the sun. Salt industry is conducted vigorously also in the Kwantung Leased Territory. The yearly outputs vary according to years, but are placed at about 3,000,000 *koku*, of which about 700,000 or 800,000 *koku* is put out in the Leased Territory.

Salt belongs to the monopoly of the Chinese Government. The salt monopoly system is not unified all over China, but is more or less different according to-

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Provinces. In the three Eastern Provinces, the system is fashioned much after the Japanese system.

The Government buys salt manufactured along the sea coasts and sends it to different centres to sell it at the specified price. This system is comparatively well-organized.

The import of no salt produced outside Manchuria is permissible into Manchuria. Smuggling is liable to severe punishment. Salt produced in Manchuria is debarred from export, except to Mongolia and the Jehol district.

In the Kwantung Leased Territory, the area suited to salt manufacture is estimated at about 2,400,000 *tsubo*, of which only one-half is now operated.

The Japan Salt Manufacturing Co., the Oriental Development Co., etc., are actively interested.

When the export of Kwantung salt to Japan and Chosen increases, the outlook of the Kwantung salt industry will appear more promising.

VI. Industry.

RAPID GROWTH OF JAPANESE INDUSTRIES. Manchuria is richly endowed by nature with vast possibilities in agriculture, stock-farming, forestry, mineral products including fuel, and other industrial materials. Still, owing to the infantile stage of the Chinese in industrial or technical lines, there are few industries worthy of the name outside oil-expressing, flour-milling, and shumshu-distilling. Even as to daily necessaries, the majority of them have had to be imported from abroad or South Manchuria.

However, as the sphere of the Japanese activities has expanded in recent years, the abundance of raw materials and fuel (coal) and cheap labour have been turned to most account, and it has resulted in the establishment of a long list of industries, and thus the dawn of an industrial colony seems to be breaking on the Kwantung Leased Territory.

CHEMICAL INDUSTRY. Chemical industry, because of any supply of coal lying at hand and also because of the cheap electric power from the Mond Gas Producer Plants being available, appears destined to thrive at and about Fushun.

Actually, at the Sulphate of Ammonia Factory attached to the Mond Gas

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Producer's Plant under management of the South Manchuria Railway Company, calcium carbide, calcium cyanide, sulphate of ammonia, etc., are being put out in considerable quantities.

At Dairen, there are the Electro-Metallurgical Co., Manchuria Barium Industry Co. and Solite Manufacturing Co. (for the manufacture of solite, a paint made from Soya Beans).

At Antung, there is the Manchuria Blasting Powder Factory.

It is a pity that, despite the repeated experiments made for the production of soda from the plentiful Kwantung salt, the proposition has not yet assumed a tangible shape.

In lines of Oil and fat industry, the Dairen Oil & Fat Industry Co. is turning out hardened oil, etc., from Soya Bean Oil, the Manchuria & Mongolia Development Co. dealing in gelatine, animal oils, and vegetable oils.

In addition, the Manchuria Paint Co. is also located at Dairen.

MANUFACTURING INDUSTRY. Bean milling ranks foremost in manufacturing industry. Bean Oil is indispensable to the Chinese as a food and for cooking. Bean milling is best developed at Dairen, which is now possessed of sixty mills. In the interior of the country, the old primitive system by which a few head of mules or donkeys and a few hands do the work of expressing oil from Beans is still found in vogue. Such is only a domestic bye-industry.

However, such extensive mills as use steam engines and express oil by hydraulic pressure are mostly found at Dairen. The Suzuki Bean Mill at Dairen is operated on the chemical extraction system which is the latest scientific method.

The round-shaped cake left after the expression of oil weighs 46 *kin* a piece, which is the standard weight for export cake.

In the fiscal year 1919, 19,693,000 piculs valued at 43,029,000 *Hk. taels* were exported to Japan.

Bean Meal, which is put out at the Suzuki Mill, is good for use as it is.

Bean Cake is used by the Chinese for cattle-feed, and by the Japanese as fertilizer.

It contains a good percentage of nutriment sufficient to be made a food-stuff, and so the idea of converting Bean Cake into an article of food should not be poohpoohed at as a fool's vagary.

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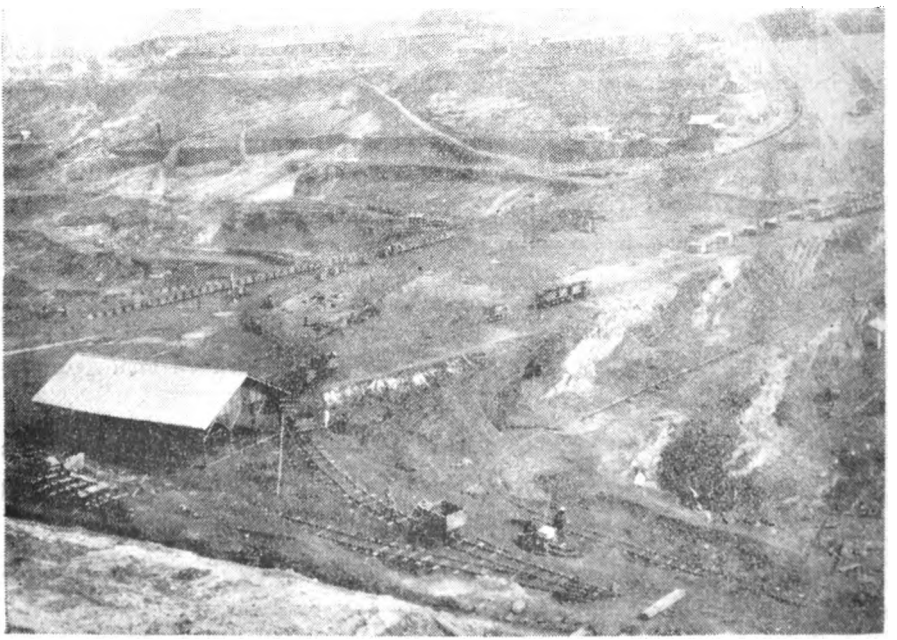
The total outputs of the bean mills along the South Manchuria Railways in the fiscal year 1919 are placed at about 1,462,000 tons worth ¥99,800,000 in Bean Cake, and 151,000 tons worth ¥22,650,000 in Bean Oil.

Bean Oil chiefly serves as material for the making of soap, oleomargarine, and paints in the United States.

Bean Cake is exported principally to Japan.

Distilling industry comes next in importance to bean milling in Manchuria.



OPEN CUT, KUCHENGTZU,

The liquors used by the Chinese in Manchuria are chiefly shumshu (distilled from kaoliang) and *huangchiu* (fermented from millet). Shumshu is the most popular drink and bears a slight resemblance to whisky.

Fengtien (Mukden) and Liaoyang and their vicinities are the centres for shumshu distillation, although distilleries lie scattered all over the country. The aggregate yearly output of shumshu is estimated at ¥13,000,000, and no inconsiderable amount is exported to China.

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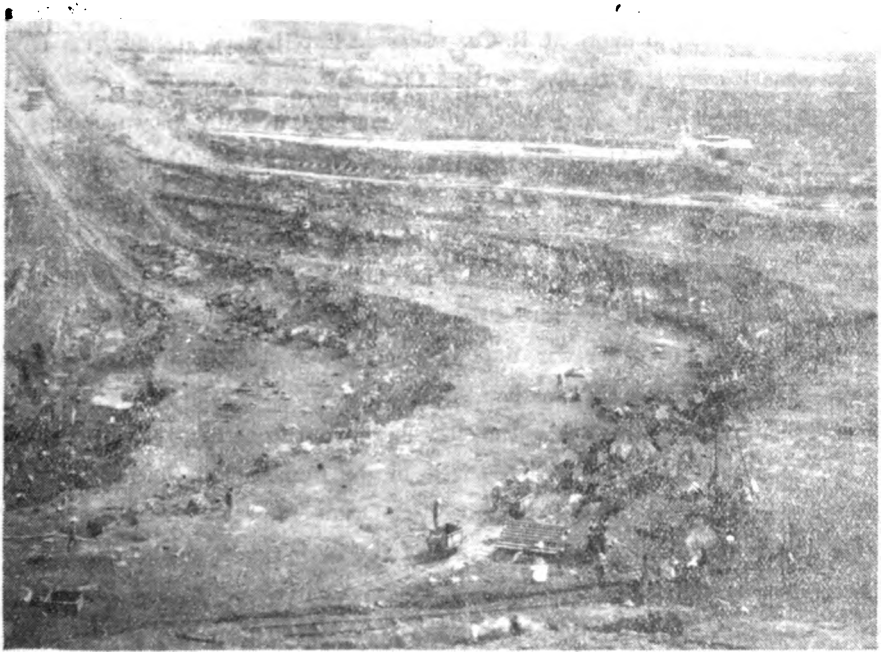
Recently there have been quite a number of people starting the manufacture *sake* (a Japanese drink fermented from *sake*,) *miso* an article of food, a necessary adjunct to breakfast in Japan which is made of beans, salt, and *koji* (fermented rice), and *soy*. Japanese made *soy* is superior to the Chinese made article in quality, and is believed to grow in demand amongst the Chinese.

The S. M. R. Co. General Laboratory has invented an improved process of fermentation, and also how to manufacture calcium lactate from the grounds of



FUSHUN.

kaoliang left after shumshu has been distilled.

Next, ceramic industry is still another indigenous enterprise that holds out a good promise. Manchurian soil is suited to ceramic industry. There are the Centinenal Ceramic Factory at Fengtien (Mukden), the Asia Ceramic Factory at Kungchuling, the East Asia Brick Kiln at Dairen, and the Branch Kiln of the Yingkou Brick Kiln at Choushuitzu, in addition to like plants of more or less scale at Anshan, Kaiyuan, Changchun, Antung, Liaoyang, Ryojun (Port Arthur), etc.

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Most of these put out bricks and fire bricks. There are further numberless Chinese bricks Kiln of modest scope.

South Manchuria, especially the Kwantung Leased Territory, abounds in limestone, material for cement.

The Onoda Cement Factory and the Dolomite Cement Co. are at Choushui-tzu close to Dairen, and also a cement company is at Fengtien (Mukden). These factories have been doing prosperous business as the Railway towns along the S. M. M. Co. Lines have grown at a good pace.

As plenty of silicious rock is found to be glass making material, there are at Dairen, in addition to the S. M. R. Co. Ceramic Experimental Institute, the East Asia Glass Factory and the Dairen Glass Co.

The utilities of glass and glass ware are not yet universally known among the Chinese inhabitants of Manchuria, but their manufacture is promising.

For instance, the Ceramic Experimental Institute above mentioned has achieved satisfactory success in the manufacture of windowpanes and hollow ware both in quality and as a business venture, and before long a glass manufacturing company will be organized on an extensive scale under private management.

In addition, with the war time boon in iron foundry business, the Dairen Crucible Manufacturing Co. was brought into being.

Then, pottery business is still another line of industry that promises to pay.

The Pottery Division which belonged to the Ceramic Experimental Institute was transferred to the China Ceramic Co. on October 1, 1920.

Among those engaged in gathering clay and other raw material, there are the Japan-Manchuria Pottery Co., Manchuria Pottery Co., etc.

Wulakai in Kirin Province has enjoyed the name of a fine pottery centre from old times.

AGRICULTURAL INDUSTRY. The chief among the industries, in which agricultural products are worked upon, may be mentioned flour milling. Since there is little wheat obtainable in South Manchuria, it has been developed in North Manchuria with Harbin for its centre. What are designated home mills employ crude simple millstones worked by from two to ten hands with the help of from a couple to a dozen donkeys. The average daily wheat consumption is from 1 *koku* to 4 *koku*. Such home mills are met with at every turn.

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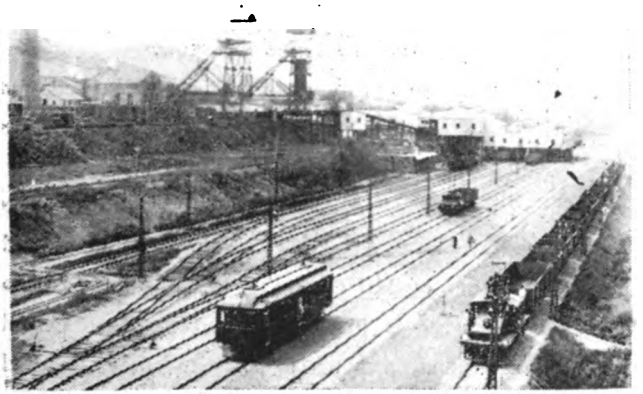
Flour mills planned on an extensive modern scale in South Manchuria have come into existence under Japanese management since the close of the Russo-Japanese War. The Manchuria Flour Mill at Tiehling was the first of the kind to be founded. Branch plants were opened subsequently at Changchun and Fengtien (Mukden). The Yuchangyuan Mill followed at Changchun. Another large mill is to be established at Kaiyuan under Sino-Japanese management. The Chinese, too, have founded a factory at Kirin. In addition, the Sino-Japanese Flour Mill, Ltd., has been organized lately. It has mills at both Dairen and Changchun.

In North Manchuria, most of the mills are owned by Russians and Chinese. The North Manchuria Flour Mill, Ltd., was the only Japanese concern existing at Harbin, but, it was amalgamated with the Manchuria Flour Mill Co. towards the end of 1920.

North Manchuria puts out wheat in large quantities, and moveover a new extensive tract of land for wheat cultivation is being added annually. Flour milling is certainly one of the most important ventures, and its products are estimated at ¥15,000,000 a year.



Oyama Shaft, Fushun Collieries.

Farther, Manchuria gives an abundance of green beans, kaoliang, maize, etc., from which starch is obtained, but somehow nobody has yet been able to build up a profitable business in this line. Among the Chinese, what is termed as bean noodles is made from Green Beans.

Recently, the Dairen Starch Factory has been formed at Dairen, and the Manchuria Starch Co at Ryojun (Port Arthur).

In Chientao (about which much diplomatic fuss has been raised), starch is made from potatoes.

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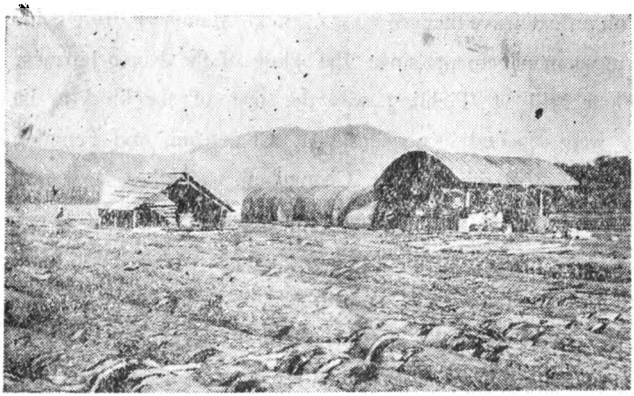

Rafts on the Sungari, near Harbin.

Since there is a large demand for bean noodles in South China and the South Seas, a factory has been brought into being under Japanese management in the suburbs of Dairen under the style of the Sino-Japanese Bean Noodle Co.

In order to contribute to the solution of the food-stuff problem confronting the Japanese people, two companies have been started at Dairen of late for the manufacture of an imitation rice from kaoliang.

Next, in view of the climate and soil of North Manchuria being adapted to the cultivation of beets, the Russians maintain an extensive beet sugar refinery at Ashiho, and the Chinese themselves one at Hulan, both in North Manchuria.

The Japanese too, have established the South Manchuria Sugar Refining Co. at Fengtien (Mukden), and when the advantages of beet-growing become more widely known among the Chinese farmers, this enterprise will grow.

At present the Mukden Refinery depends on the native-raised beets for working material from October to the ensuing February, and for the rest of the year, crude sugar is imported and refined.

By the side of sugar refining, manufacture of tobacco is also promising. The East Asia Tobacco Co. keeps factories at Yingkou (Newchwang), Tientsin, and Fengtien (Mukden). The total outputs of leaf tobacco in Manchuria amount to about 50,000,000 *kin* a year. Still what is imported thereto from the United States, Japan, Chosen, and South China, amounts to between ¥6,000,000 and ¥7,000,000 worth.

The British-American Tobacco Co. may be looked upon as the master of the tobacco situation in China, but in Manchuria, the East Asia Tobacco Co. is competing with the other.

Besides, there are at Fengtien (Mukden) the China Tobacco Co. and

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Sanlin Kungsu, and at Dairen the Oriental Tobacco Co. and Manchuria Tobacco Co., but none of them has attained any degree of importance.

The S. M. R. Co. is now engaged in the comparative study of American and Japanese tobacco plants.

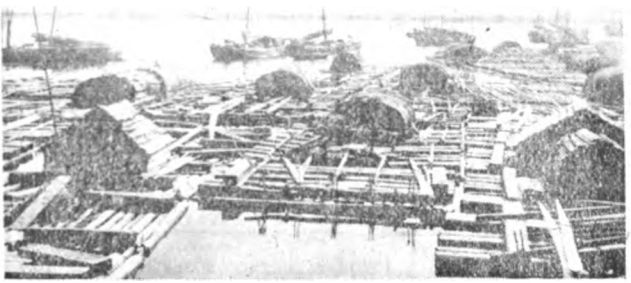
The Manchuria Beer Brewery Co., at Dairen, having a brewery at Ryojun (Port Arthur) uses barley and hops raised in Manchuria.

In Manchuria, there is plenty of live stock, but industries based on leather and wool have sprung up only recently, and hides, animals' bones, wool, etc., used to be exported abroad as they were.

In recent years, the Manchuria-Mongolia Woollen Manufacturing Co. has been founded at Fengtien (Mukden); the Manchuria-Mongolia Development Co. at Dairen; and the Manchuria Brush Factory at Fushun.

The leather outputs are now put at Y2,000,000 a year.

Next, wild sericulture claims due recognition. Wild silkworms are raised in the Tungshan (Easten Hill) District to the east of Kaiyuan and the Liaotung Peninsula along the Mukden-Antung Line, and in the region lying between Antung and Haicheng. Their annual yields are estimated at 80,000,000 *kin* valued at Y20,000,000, in addition to Y5,000,000 worth of tussah silk.



Rafts on the Yalu, near Antung.

Wild filatures managed by Japanese number only a few, and the rest is done by the Chinese farmers, much of it being carried on as a domestic bye-industry. A major portion of wild cocoons is exported yearly Chefoo way.

In view of the total outputs of hemp amounting to 50,000,000 *kin* and also

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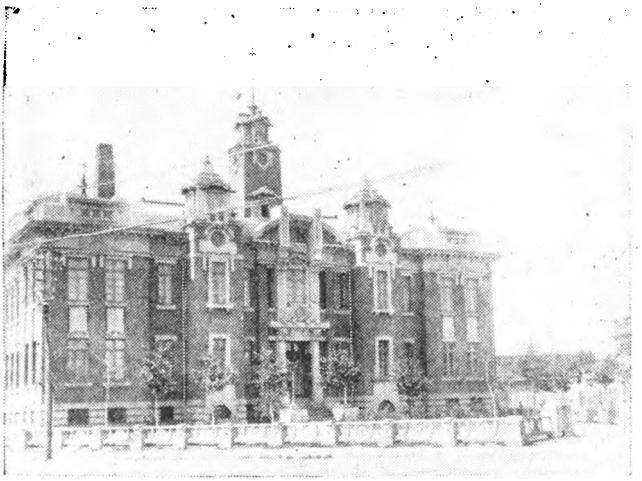

Changchun Exchange, Changchun.

of an enormous quantity of gunny bags being in request to pack Beans, wheat, kaoliang, etc., in, the Manchuria Hemp Manufacturing Co. has been established at Dairen, and the Manchuria - Mongolia Fibre Industry Co. at Fengtien (Mukden).

Among other Japanese enterprises may be included manufacture of matches, gunpowder, fertilizer, dye-stuffs, wickerwork made of golden-willow twigs, etc.

Poplar and other timbers for making match sticks are found in plenty, and this undertaking is much prospering exclusively under Japanese management.

Paper mills at Kirin, Liaoyang, and Petune (Hsiao-Kulun) and also dyeing and weaving works at Yingkou, Liaoyang, and Chinchow (this side Shanhaikwan on the Peking-Mukden Line of the Chinese Government Railways) may be also mentioned as among the native industries handed down from old days.

The weights, etc., of wild cocoons, dried, per 100 grains, are as under :—

		Weight	Silk tissue	Larva
		momme	*momme*	*momme*
Spring cocoons	Thicker	46.9	10.7	36.0
	Thinner	30.7	6.1	24.5
Autumn cocoons	Thicker	58.7	17.6	41.1
	Thinner	37.6	8.8	28.8

Remarks : 120 *momme* makes 1 lb.

STEEL & IRON WORKS & OTHER MECHANICAL INDUSTRIES. Iron and steel manufacturing is carried on at the Anzan Iron & Steel Works and also by the Penchihu Colliery & Mining Co., as remarked under the heading of the "Mining." Foundry work is done on the largest scale at the S. M. Railway Workshops and its branch workshop at Liaoyang. The manufacture and repairing

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of rails, car bodies, wheels, and other rolling stock accessories, and other machinery are executed to the amount of ¥3,000,000 a year.

The Dairen Branch of the Kawasaki Dockyard Co. undertakes repairing of vessels and construction of vessels of smaller-type.

In addition, there are the Dairen Machinery Works, Manchuria Mechanical Works, etc.

At Antung there is the Antung Iron Works.

As to electricity works, since there is no hydraulic power available, steam and gas are depended upon for the generation of electricity.

The S. M. R. Co. supplies light and power at Dairen, Changchun, Fengtien (Mukden), Antung, and Fushun where it keeps power stations. At Dairen and Fushun, electric tram cars are operated.

There are also electric light companies at Wafangtien, Tashihchiao, Ssupingkai, Kungchuling, etc., to which substantial support is given by the Railway Company.

The Yingkou Waterworks & Electricity Co. lies under Sino-Japanese management and is engaged in telephone business in addition to supplying water and electricity.

At Harbin an electricity works formerly owned by Russians has been bought by the North Manchuria Electricity Co. which serves both light and power.

Under Sino-Japanese joint, and exclusive Chinese, management, there are electric light companies at Liaoyang and Tiehling, Manchuria Electricity Co. at Kaiyuan, Kirin Electricity Plant at Kirin, Taolu Electric Light Co. at Taolu, and North Shanchengtzu Electricity Co. at North Shanchengtzu. In addition, most of the cities along the Chinese Eastern Railway are provided with electric light.

In the line of electro-chemical industry, there are the Tahua Electro-Metallurgical Co. under Sino-Japanese joint management, East Asia Electric Industry Co., China Electric Industry Co., and South Manchuria Electricity Co, all at Dairen, and are earning fair results.

As to gas, there are gas works at Dairen and Fushun only, both under S. M. R. Co. management.

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VII. Mining.

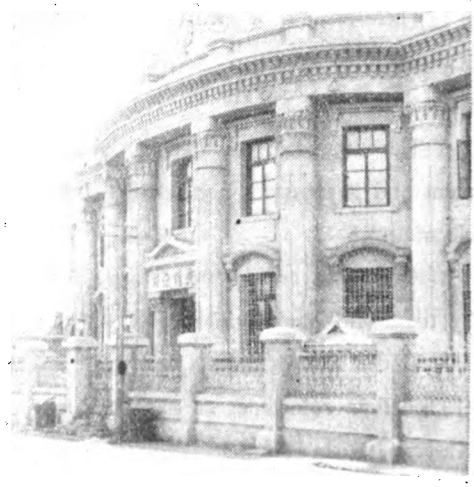
Manchuria and Mongolia are rich in mineral products of different kinds, but such mines as are being worked are comparatively small in number, and their exact reserves are hard to be ascertained in many cases.

In metallic minerals, iron and gold occupy important places. As regards non-metallic minerals, they are also varied. Coal is by far the most important, and silicious stone, mica, asbestos, graphite, talc, fluorite, magnesite, limestone, soda, etc., are found in considerable quantities.

Gold in Manchuria and Mongolia occurs for most part in the shape of placer deposits, what there is obtainable from gold veins being in insignificant quantity.

What the outputs are is not available, but in Heilungkiang Province alone, the total products are placed at ¥20,000,000 worth per annum.

Not an extensive bed of silver, copper, lead, zinc, etc., has yet been discovered, except the silver and copper mine at Tienpaoshan in Chientao, Kirin Province, which deserves notice.



Bank of Communications, Fengtien (Mukden).

The iron reserves are estimated to be in enormous quantities. The Anzan Iron & Steel Works and the Penchihu Colliery & Mining Co. are the only places where iron and steel manufacture is conducted.

The Penchihu Colliery & Mining Co. is under Sino-Japanese management. Lime and coal found about Penchihu and iron ore mined at Miaoerhkou, at a short distance from Nanfen Station, are used as materials for the blast furnace, which was opened to service in 1915. The daily output is 200 tons.

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The S. M. R. Co. Anzan Iron & Steel Works was founded during the War for the purpose of supplying iron for Japan's own use. For coke material, both Fushun and Penchihu coals are used. Some day the Works is expected to produce 1,000,000 tons of pig iron or 800,000 tons of steel. At present, two blast furnaces have been completed, but only one of them is being worked.

COAL. Coal is the mineral product of foremost importance in all Manchuria and Mongolia. Fushun Coal is now universally known all over the world.

In addition to Fushun Collieries, there are Penchihu, Yentai, and Hsinchiu Collieries.

Fushun Collieries were transferred to Japanese possession as a result of the Russo-Japanese War. They lie some 25 miles east of Fengtien (Mukden) and they cover 20,000,000 *tsubo* in area. The thickness of the coal seam ranges from 78 ft. to 480 ft., the average thickness being of from 130 ft. to 175 ft. The coal reserve is believed to be uniquely immense and is estimated roughly at over 1,000,000,000 tons, of which more than 80% can be mined by the adoption of the most up-to-date mining method. At present the daily outputs are 10,000 tons.

Yentai Colliery also belongs to the S. M. R. Co. The coal reserve available for mining is placed at 40,000,000 tons. The present daily output is about 200 tons.

Penchihu coal has a strong calorific power and is suited to the manufacture of coke for steel works. It is a semi-anthracite and its coal reserve is put at 200,000,000 tons. The coal seam is from 2 to 9 ft. thick.

Hsinchiu Colliery situated in the west of the Liao River is now well known. Boring experiments are now being conducted. It is said to have six seams, each from 5 ft. to 30 ft. thick. What its coal reserve amounts to is yet unknown, but some geologists place it even above that of the Fushun Collieries.

There are also other collieries in South Manchuria, but only a few are found in North Manchuria where the Chinese are working them by hand and putting out some to fill the local needs.

NATURAL SODA. The Eastern Part of Inner Mongolia is held as a great belt for natural soda. The low plains, lakes, and swamps, and their neighbourhoods become hoary as if by frost in the dry season in spring and autumn. Sometimes the soda forms in layers and present a beautiful sight.

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Natural soda is worked at the native soda depots. From spring to summer, crude soda is compressed into the form of brick.
and from autumn to winter, crystallized soda of comparatively fine quality is obtained. In Chelimu Tribe (Inner Mongolia), the noted lake abounding in soda, which is called Tapusu, is located. On the upper part of the West Liao, there is a plain known as Pali-Shantien chientzu which also yields a good quantity of natural soda.

As the means of communications are developed with the diffusion of civilization, natural soda of Inner Mongolia is bound to be exploited. Especially, as the Chengchiatun-Paiyintala extension of the Ssupingkai-Chengchiatun Section of the Ssupingkai-Taonan Line is opened to traffic before the end of the current year (1921), the natural soda industry in those regions is expected to be strikingly developed.

MAGNESITE. Manchuria abounds with limestone, which usually contains more or less magnesite.

Near Tashihchiao (the junction station for the Yingkou (Newchwang) Branch Line) a magnesite of exceptional dimensions has been discovered, and as it has proved excellently suited to the making of fire-bricks, it is now supplied to the Government Steel Works, Edamitsu, and the Anzan Iron & Steel Works, etc. Lignoid and another flooring material are manufactured by the South Manchuria Mining Co.

In addition, fire-clay, limestone, silicious stone, felspar, and other useful minerals are found, and are being put to suitable uses.

In terms of the Sino-Japanese Treaty concluded in 1915, nine mines are designated for the Japanese to bore experimentally and to work.

Of this number, the collieries are located at Niuhsintai (at 10 miles east of Penchihu), Tienshihfukou (55 miles east of Penchihu), Shansungkang (at 23 miles southeast of Chaoyangchen), Tiehchang (20 miles northeast-east of Tunghua), Nuantitang (25 miles southwest of Chinchow this side Shanhaikwan), Kangyao (33 miles north northeast of Kirin), and Shansungpei in Chientao (20 miles north of Kwainei, the terminus of the proposed Kirin-Kwainei Railway).

The iron mine about Anshan and the gold mine at Chiapikou (at 30 miles east of City of Kirin) are also included in the above list.

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VIII. Trade.

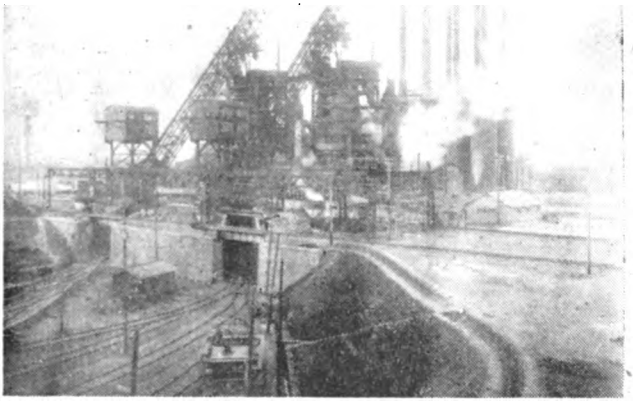
TRADE ORGANIZATIONS. On the list of the Japanese trade organizations along the South Manchuria Railways, the Chambers of Commerce at Dairen, Fengtien (Mukden), Antung, Changchun, and Yingkou are the most prominent.

The "Manchuria & Mongolia Trade & Industrial Reports," as published in Japanese by the Dairen Chamber of Commerce, are extensively read as guide to those wishing to start activity in Manchuria and Mongolia.

The Chambers at Fengtien (Mukden), Yingkou, Antung, and Changchun also publish monthly reports in Japanese which have a referential value.

Among the Chinese, as the case is at every trade centre in China, they keep a Guild of their own.

Next, as to the Exchanges, the Dairen Produce Exchange was established in 1913; in 1915, a Produce and Currency Exchange was opened at Kaiyuan and another at Changchun in 1916. In 1917, a Currency Exchange was established in the Dairen Produce Exchange, and now the Produce and Currency Exchanges are known as the Dairen Exchange.



Blast Furnace, Anshan Iron & Steel Works.

In 1919, a Produce and Currency Exchange was opened at Kungchuling, Ssupingkai, and Tiehling, and in 1920, at Fengtien (Mukden), Yingkou, and Liaoyang.

In addition a sharestock and merchandise exchange has been founded at Dairen and Antung under private management.

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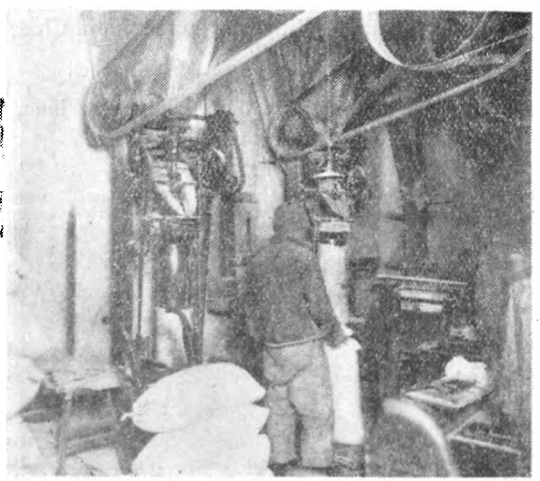
On the above mentioned Exchanges are dealt in Beans, Bean Cake, Kaoliang, Bean Oil, wheat Italian millet, etc.; gold notes issued by both the Bank of Chosen and the Yokohama Specie Bank, Russian rouble notes, silver notes issued by the Yokohama Specie Bank, Chinese small silver coins, and Chinese small silver coin notes.

How is it that these currencies are dealt in on the Exchanges will be enlarged upon under the heading of "Currency," but a few words may be put in here for explanation.

In Manchuria, owing to the great variety of currencies in circulation and more particularly because of the constant fluctuations in their exchange rates, the currencies have come to be looked upon as something like articles of commodities.



Packing Room, the Tienhsingfu (Chinese Flour Mill), Changchun.

Because of this peculiar feature in the currency situation in South Manchuria, excepting the privately-managed exchanges (sharestock and merchandise) at Dairen and Antung, the Exchanges lie under Government management, and in order to guarantee the delivery of the stocks bargained for on the given date of delivery and also to settle the accounts between sellers and buyers, a trust and guaranty company under private management is attached to each Exchange.

Further, at Antung, Tiehling Changchun, and Harbin, commercial museums are maintained for the purpose of exhibiting samples of Japanese products.

In addition, there are at Dairen the Manchuria Staple Produce Dealers' Association, Dairen Staple Produce Dealers' Union, Currency Future Dealers' Union, Manchuria Building Contractors' Union, etc., to keep their respective members in touch with one another.

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FOREIGN TRADE. Manchuria was first opened to foreign trade in the 8th of Hsienfeng under the Manchu Dynasty (1858) by virtue of the Tientsin Treaty concluded between Great Britain and China in the same year. Newchwang (Yingkou) was then declared an open port.

Subsequently with the Russian activities in Manchuria, the port of Dairen (then Dalny) was opened as a free port and a railway was constucted between Harbin and Port Arthur, connecting at Harbin with the Manchouli-Pogranichnaya Section of the Chinese Eastern Railway which forms a link of the great Trans-Siberian Railway system.

The construction of the above railway marked the beginning of decay to the port of Newchwang, and when the Japanese assumed the leasehold of the Kwantung Leased Territory, the products of Manchuria began to be drawn to the port of Dairen.

With the construction of the Mukden-Antung Line on the standard gauge the same as the other Sections of the South Manchuria Railway system, to take the place of the narrow gauge line built during the Russo-Japanese War, followed soon afterwards with the construction of the railway bridge over the Yalu, the town of Antung started to grow.

All along the South Manchuria Railways are situated trade centres where the products are put on the market and where the imports are distributed to the inhabitants. Of these, Fengtien (Mukden), Changchun, and Kaiyuan seem to have the most glowing prospect, as Harbin in North Manchuria does.

The gateways of Manchuria trade are Dairen, Yingkou, Antung, and Vladivostok.

Of these four, the port of Dairen has made the most conspicuous progress.

In 1919, its trade returns aggregated *Hk. Tl.* 260,000,000, by which figure Dairen outstripped Tientsin, taking the second place next to Shanghai only, among the China ports.

The principal exports are Beans, Bean Cake, Bean Oil, kaoliang, wild cocoons, coal, coke, and iron materials, whilst among the chief imports may be mentioned cotton fabrics, cotton yarn, pongee and pongee silk fabrics, woollen goods, sugar, rice, flour, etc.

For reference sake, the export and import returns for 1919 for Dairen, together with the comparative trade returns for the three ports of Dairen, Yingkou, and

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Antung, according to the North China Annual Trade Reports compiled by the S. M. R. Co., are appended below:—

Exports from Dairen in 1919.

	piculs		Hk. Tl.
Beans (Soya)	8,831,164		24,750,377
Maize	531,252		828,753
Italian millet	646,647		1,739,480
Other Kinds of Beans	1,033,917		2,624,436
Kaoliang	879,273		1,318,910
Wheat	744,473		2,047,301
Sesamum	189,615		967,943
Other Cereals	189,615		527,202
Melon-seeds	27,230		175,410
Gound-nuts	60 416		248,944
Other seeds	483,550		1,703,877
Vegetables and fruits	4,311		23,152
Wheat flour	32,574		143,976
Bean noodles	972		6,473
Eggs	5,000	pieces	66
Marine products	13,871	piculs	85,527
Slumshu, etc.	15,421		124,756
Tobacco	—		171,737
Other comestibles and beverages	—		569,056
Bean Cake	16,639,962		36,851,244
Bean Oil	1,991,933		17,369,655
Ground nut oil	11,927		101,141
Paulownia oil	171		2,205
Linseed oil	9,394		83,043
Other oils and fats	23,597		188,643
Hemp	8,431		60,694
Raw cotton	710		20,540
Wild cocoons	105,128		1,671,849
Tussah silk	4,292		753,464
Other sericultural products	—		321,482
Bristles	895		53,077
Feather & down	30,865		990,968
Leather & hides	—		742,609
Horn, tusk, etc.	559		1,761
Animal's bones	156,137		193,610
Domestic Cattle & poultry	3,534 head / 92,300		25,230
Animal fat	1,117	piculs	13,917
Timber			56,923
Firewood & charcoal	6,151		8,549

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		piculs	Hk. Tl.
Coal & coke		314,219 tons	1,721,245
Other mineral products		—	149,375
Medicines & medicinal material			158,218
Dye-stuffs & paints		—	17,805
Ginseng		86,356 *kin*	109,153
Metals & metal ware		—	4,752,185
Other articles		—	1,946,172
Exports	H.K. Tl.	106,422,133	
Re-exports { Chinese ware	11,739,087		
Re-exports { Foreign ware	10,367,447		
	22,106,534		
		22,106,534	
	H.K. Tl.	128,528,667	

Imports to Dairen in 1919.

	piculs	H.K. Tl.
Cotton fabrics		27,096,535
Silk & silk & cotton fabrics		1,551,772
Wool & wool & cotton fabrics		1,465,609
Other fabrics		2,771,694
Cotton yarn		7,454,317
Raw cotton	14,921 piculs	412,268
Cocoons & silk yarn	3,468	709,604
Other yarns		435,972
Dry goods	—	4,467,641
Rice	1,375,103	6,116,892
Other cereals & seeds	758,319	1,980,835
Wheat flour	248,733	2,205,099
Vegetables & fruits	299,952	783,811
Sugar	533,938	3,626,817
Miso & soy	15,109	97,305
Marine products	161,883	888,112
Other comestibles	—	958,428
Tea & coffee	78,266	1,010,276
Sake & other beverages	—	1,576,835
Tobacco	—	4,553,876
Cigarette making material		1,244,111
Furniture	—	883,229
Medicines & medicinal materials		1,771,326
Dye-stuffs & paints	—	623,538
Kerosene oil	8,961,668 gallons	3,118,302
Machine oil		524,718
Other oils & fats		3,866,578

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	piculs	Hk. Tl.
Candles	5,330	104,385
Candle making material		397,385
Soap		301,596
Matches	4,654,774 gross	1,287,887
Match making material	—	31,839
Charcoal & firewood	129,818 piculs	86,255
Coal & Coke	258,420 tons	1,833,123
Iron & Steel	1,630,599	9,840,664
Other metal ware	269,096	2,202,908
Hardware	—	1,036,706
Machinery, tools, etc.	—	10,130,812
Cement	927,880	1,002,120
Timber	—	2,378,272
Building material	—	646,739
Railway material		109,840
Electricity material		2,029,741
Fine art & toilette articles		428,321
Leather & hides, wool, bones, etc.		1,200,332
Paper		2,408,691
Printed matters & stationery		750,955
Glass & glass ware		782,854
Pottery, China & earthen ware		323,327
Gunny bags, etc.	25,653,640 pieces	4,812,361
Sundries		4,815,404
Total		130,148,217

Comparative Table of Exports & Imports.

		Exports	Imports	Total	Percentage	
		tons			Exports	Imports
Dairen	1917	2,420,145	802,061	2,321,186	73%	27%
	1918	2,855,139	1,040,016	3,805,155	73%	27%
	1919	3,125,813	1,509,916	4,035,729	67%	33%
Yingkou	1917	104,153	44,057	140,110	70%	30%
	1918	145,101	70,358	221,543	66%	34%
	1919	100,308	100,002	200,310	63%	37%
Antung	1917	22,480	295,747	318,236	7%	93%
	1918	30,000	105,105	105,105	15%	85%
	1919	101,872	283,739	385,611	27%	73%

The leading mercantile firms include the Mitsui Bussan Kaisha, the Suzuki & Co., the Okura & Co., the Mitsukoshi, and the Kodera & Co.

BANKS. In Manchuria, there are such foreign banks operating as the Russo-Asiatic Bank, the Hongkong & Shanghai Banking Corporation, the International Banking Corporation, etc.

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Among the Japanese banks, the Bank of Chosen is authorized to issue convertible notes having a compulsory circulating power among the Japanese, whilst the Yokohama Specie Bank is authorized to issue convertible notes to the end of converting the Japanese gold currency into the silver currency which is native in Manchuria. Both banks occupy each a special position.

List of Japanese Banks.

	Authorized capital	Paid up capital	Branches
Bank of Chosen	¥ 80,000,000	¥50,000,000	
Dairen, Antung, Fengtien (Mukden), Kaiyuan, Ssupingkai, Chengchiatun, Changchun, Harbin, Kirin, Yingkou, Ryojun (Port Arthur), Liaoyang, & Lungching (Chientao).			
Yokahama Specie Bank	¥100,000,000	¥100,000,000	
Dairen, Fengtien (Mukden), Kaiyuan, Changchun, Harbin, & Yingkou.			
Chenglung Bank	¥20,000,000	¥ 9,500,000	
Dairen, Yingkou, Fengtien (Mukden), Port Arthur, Changchun, Kaiyuan, Fushun, Chinchow, Chengchiatun, & Ssupingkai.			
Dairen Bank	¥ 3,000,000	¥ 2,000,000	Dairen, Lishan & Kaiyuan.
Liaotung Bank	3,000,000	1,575,000	
Dairen, Chinchou, Pulantien, Wafangtien, & Pitsuwo.			
Lungkou Bank	¥11,000,000	¥ 4,862,000	
Dairen, Lungkou, Harbin, Tsingtao & Kungchuling.			
Dairen Commercial Bank	¥ 2,000,000	¥ 1,954,500	Dairen.
Educational Savings Bank	500,000	200,000	Dairen & Tokyo.
Ryojun Bank	1,500,000	487,500	Ryojun & Dairen.
South Manchuria Bank	1,500,000	375,000	Anshan.
Anzan Bank	1,000,000	250,000	Anshan.
Fushun Bank	3,000,000	750,000	Fushun.
Sino-Japanese Industrial Bank ...	10,000,000	2,500,000	Mukden.
Tiehling Commercial Bank	1,000,000	250,000	Tiehling.
Sino-Japanese Bank	1,000,000	1,000,000	"
Kaiyuan Bank...	1,000,000	500 000	Kaiyuan.
Changchun Business Bank	1,000,000	400,000	Changchun.
Manchuria Commercial Bank... ...	1,400,000	1,400,000	Mukden, Antung & Fanchiatun.
Harbin Bank	500,000	125,000	Harbin.
Pingho Bank	1,000,000	250,000	Kirin.
Bank of China	60,000,000	12,366,355	
Mukden, Dairen, Yingkou, Antung, Liaoyang, Changchun, Kaiyuan, Tiehling, Kirin, Chengchiatun & Harbin.			
Bank of Communications	¥15,000,000 tael	7,500,000 tael	
Mukden, Dairen, Yingkou, Antung, Liaoyang, Changchun, Kaiyuan, Kirin, Chengchiatun, Harbin & Ssupingkai.			
Three Eastern Provincial Bank ...	¥ 600,000	¥ 600,000	
Mukden, Yingkou, Liaoyang, Tiehling, Kaiyuan, Changchun, Antung & Kungchuling.			

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	Authorized capital	Paid up capital	Branches
Mukden Industrial Bank	S.¥1,300,000	S.¥1,300,000	Mukden, Liaoyang, Tiehling & Kaiyuan.
Kirin Provincial Bank	¥30,000 1,500,000 tiaos	¥30,000 1,500,000 tiaos	Kirin, Changchun & Harbin.
Heilungkiang Provincial Bank ...	17,000,000tiaos	50,000,000 tiaos	Tsitsihar, Mukden, Tiehling, Kaiyuan, Changchun & Harbin.
Frontier Development Bank	S.¥2,000,000		Mukden, Yingkou, Liaoyang, Tiehling,-Kaiyuan, Changchun, Kirin & Chengchiatun.
Huafu Development Bank	¥6,000,000		Mukden & Yingkou.
Yitung Bank	G.¥1,000,000	250,000	Changchun.
Kuanghsin Kungsu	500,000 tael	500,000 tael	Tsitsihar.
Pinkiang Savings Bank	¥1,000,000	¥629,000	Harbin.
Harbin Commercial Bank	2,500,000	1,262,250	»
Yushang Bank	5,000,000	2,500,000	»
Pinkiang Sanhsin Bank	2,500,000	1,250,000	»
Pinkiang Business Bank...	2,500,000	1,000,000	»
Three Eastern Provincial Bank ...	8,000,000		Harbin, Mukden & Changchun.
Russo-Asiatic Bank...	45,000,000 roubles 3,500,000 tael	45,000,000 roubles 3,500,000 tael	Petrograd, Dairen, Harbin Changchun, Hailar, Manchouri, Newchwang, & Yingkou.
Hongkong & Shanghai Banking Corporation	S.¥15,000,000	S.¥15,000,000	Hongkong, Shanghai, Yingkou, Dairen & Harbin.

OTHER FINANCING MEDIUMS. On the Chinese side there are private banks, exchange brokers, etc. Exchange brokers engage in speculative deals in foreign monies and render exchange and loan services. Many of the Chinese banks organized in modern style issue convertible notes.

With the development of the economic China in recent years, the demand for capital for exchange and loan services has increased, and as a means of meeting the sore needs of the hour, the Chinese banks often resort to the issuance of bank notes. The reckless issue of these notes always take from the stability of the financial market, and what is styled convertible notes are in fact non-convertible.

CURRENCIES. As above stated, in Manchuria there are Currency Exchanges on which currencies are dealt in because of there being so many kinds of currencies in circulation.

Lately, gold notes of the Bank of Japan and the Bank of Chosen are gaining in circulation.

The following gives a review of the currencies circulating in Manchuria :—

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(1) Native Currencies.

Copper: In Fengtien Province, 160 cashes are equivalent to 1 *tiao*; in Kirin Province, 500 cashes make 1 *tiao*.

Provincial Copper notes circulate in Kirin and Heilungkiang Provinces.

Originally these notes were convertible into copper cash, but have now become inconvertible.

Silver: Sycee;

The silver percentage and weight varies according to places.

For instance, Yingkou tael weighs 552.06784 grains of silver of 992 in purity.

Transfer Money;

This system is maintained at Yingkou. It is a trust account institution based on Yingkou tael.

Chinese small silver coins; 339.964128 grains of silver is reckoned as 10 sen.

Chinese small silver coin notes; They are bank notes based upon Chinese small silver coins

Large dollars; 3744 grains are reckoned as S.¥ 1.

Large dollar notes; They are bank notes based on large dollars.

Tiehtzu; They are notes payable at sight, based on Chinese small silver coins.

(2) Foreign Currencies.

Silver: 1 ¥ Silver; It is the old Japanese silver yen coin and weighs 375.13136 grains.

Silver notes of Yokohama Specie Bank; they are convertible notes supported on ¥ 1 silver coins.

Mexican Dollars; Each weighs 374.97 grains.

Gold: Bank of Japan notes; 11.574 grains of gold are accepted as Y1, and the Bank of Japan notes are supported on the Y1 coins.

Bank of Chosen notes; They are convertible notes supported on Bank of Japan notes.

Japanese subsidiary coins; They are subsidiary coins to the Japanese gold coins.

Russian rouble notes; 11.948 grains are reckoned as 1 rouble, and rouble notes were supported on these coins. But since the Russian Revolution these notes have practically become non-convertible.

Russian subsidiary coins; They are subsidiary coins to the rouble.

TRUST & GUARANTY BUSINESS. As financing mediums outside the banks, there are the Oriental Development Co. and the Eastern Provinces Enterprise Co., each of which has its own functions to perform.

In addition, trust & guaranty companies are attached to the Exchanges at Dairen, Liaoyang, Tiehling, Kaiyuan, Ssupingkai, Kungchuling, Changchun, and Yingkou.

While the War time inflation lasted, many security & bond companies were founded. There are thirteen companies belonging to this class at Dairen;

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four at Antung; two at Fengtien (Mukden); and one each at Wafangtien, Tashihchiao, Anshan, Liaoyang, Tiehling, Kaiyuan, Changchun, Fushun, and Yingkou.

WAREHOUSING BUSINESS. The South Manchuria Railway Company is engaged in warehousing business at the Dairen Wharves and the principal stations along the S. M. R. Lines.

Unlike ordinary warehousing business, the transportation by railway of the goods accepted into custody as well as the storage of goods that have arrived by railway are undertaken, and in order to distinguish them from ordinary warehousing business, the goods are taken into custody under either Despatch Storage or Arrival Storage.

Then there are two ways of custody, that is, under cover and in the open.

As regards Bean Cake, the Mixed Storage system has been instituted and this system has been extended to Beans, and also to wheat put out in Manchuria and carried by railways to Dairen (the last mentioned taking effect from October 1st, 1921),

The general warehousing business has become developed only recently.

At Dairen there are the Fukusho Co., Enterprise Co. and Dairen Warehousing Co., in addition to South Manchuria Warehousing & Building Co., and Manchuria Transportation & Warehousing Co,

At Fengtien (Mukden) there are the South Manchuria Warehousing & Trust & Guaranty Co. and Mukden Forwarding & Warehousing Co. Fushun, too, has a warehousing company; so has Changchun, Kirin, and Chengchiatun.

Yingkou has a warehousing & steamship company. Pitsuwo, in the northeastern part of the Kwantung Leased Territory, also has one.

Harbin has two warehousing companies (Japanese).

INSURANCE BUSINESS. No insurance company of Manchurian origin yet exists. All are either branches or agencies of insurance companies of Japan or elsewhere.

In life insurance, the Teikoku, Chiyoda, Meiji, Nisshin, Daiichi, etc., are the most active; in the line of fire insurance, the Meiji, Tokyo, Nippon, Yokohama, etc., are leading concerns. In addition, a number of foreign insurance companies are doing business.

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What calls for special mention is the insurance of goods at the Dairen Wharves under the custody of the S. M. R. Co. The Railway Company undertakes the insurance of these goods unasked and without the consent of the owners.

In the case of the open storage goods, however, the Railway Company holds itself liable to the extent of 30%, the balance of 70% being borne by the Insurance Companies concerned jointly.

TRANSPORTATION BUSINESS. The goods and passenger traffic returns of the South Manchuria Railway, which serves as the artery of the economic system of Manchuria, are as follow :—

	Main Line	Mukden-Antung Line	Total
Average working mileage	524.5 miles	171.4 miles	686.3 miles
Passengers	8,044,732	1,464,158	9,274,114
Goods	9,311,249 tons	2,339,000 tons	10,090,672 tons

The above are the returns for the six months from April, 1919, to March, 1920.

As general forwarding agents, there are the Manchuria Forwarding Co., Yamaguchi Forwarding Agency, Dairen Forwarding Co., etc., in addition to Dairen Marine Transportation, Taisho Marine Transportation, and Shantung Transportation.

Along the S. M. Railway lines, there are the Changchun Forwarding Co., at Changchun, the Antung Marine Transportation Co. at Antung, the Anshan Transportation Co. at Anshan, the Pulantien-Pitsuwo Motor Car Transportation Co., etc.

The transportation business is, in some cases, carried on by some of the trust & guaranty companies.

IX. Communications.

RAILWAYS. That Manchuria has been pushed to the fore before the world is owing to the construction of railways through the length of Manchuria by Russia as part of her Far Eastern policy.

At present, the Russians are operating the Chinese Eastern Railway, whose Southern Section (from Harbin to Kwanchengtzu) connects at Changchun with the South Manchuria Railway.

The main line of the Chinese Eastern Railway connects with Vladivostok via the Ussuri Line connecting at Pogranichnaya. On the west, the Line connects at Manchouli with the Trans-Baikal Line, and it is said that an interlineal agreement

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between the Chinese Eastern and the Trans-Baikal Lines for running regular trains between Vladivostok and Chita is rumoured to have been concluded.

The Chinese Eastern Railway itself is now being worked conjointly between the Russians and the Chinese, and also lies under the supevi ion of the Interallied Technical Board, of which Mr. J. F. Stevens is Chairman.

The South Manchuria Railway has the Dairen-Changchun Line for the main line, and in addition to the Mukden-Antung Line, it has three branch lines; viz., the Dairen-Ryojun (Port Arthur), the Tashihchiao-Yingkou (Newchwang), and the Hunho-Fushun.

Besides, there is the Ssupingkai-Taonan Line of the Chinese Government Railways, of which a 35 mile section from Chengchiatun (at 55 miles from Ssupingkai on the S. M. R. main line) westward to Talinyingtzu is to be opened to provisional traffic in November, 1921.

The Kirin-Changchun Line, too, belongs to the Chinese Government.

The Peking-Mukden Line of the Chinese Government Railways has been constructed mostly on British capital and the posts of Traffic Manager and Chief Accountant are held by Britishers.

The following is a table giving the Railways in existence in Manchuria:—

	versts	
Chinese Eastern Railway (Western Section) Manchouli-Harbin ...	876	Russo-Chinese Management
(Eastern Section) Harbin-Pogranichnaya ...	512	
(Southern Section) Harbin-Kwanchengtzu ..	222	
Jalainor Colliery Branch line	7	
Total	1617 versts	
	miles	
South Manchuria Railway, Main Line, Dairen-Changchun	438	under Management South Manchuria Railway Company.
Mukden-Antung Line, Suchiatun-Antung	162	
Ryojun (Port Arthur Branch, Choushuitzu-Ryojun)...	32	
Fushun Branch, Hunho-Fushun	33	
Yingkou Branch, Tashihchiao-Yingkou	14	
Yentai Colliery Branch, Yentai-Yentai Colliery	9	
Total	674 miles	
Kirin-Changchun Line, Changchun-Kirin	79	Chinese Government Railways under management of Chinese Government.
Ssupingkai-Taonan Line, Ssupingkai-Chengchiatun	55	
Part of Peking-Mukden Line, Mukden-Shanhaikwan	261	
Yingkou Branch Line, Yingkou-Koupantzu	57	
Total...	452 miles.	

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Remark: As above referred to, the Ssupingkai-Taonan Line is having an extension from Chengchiatun under construction, and a 35 mile section is about to be opened for traffic shortly.

As may be seen from the above table, there are now over 2700 miles of railway in South and North Manchuria.

When the Kirin-Kwainei Railway starting at Kirin and terminating at Kwainei (Chosen, Korea), together with the five proposed Railways in South Manchuria and Inner Mongolia, in the event of their being completed and opened for operation, something like 1500 miles more of railway will be added.

WATERWAY. The port of Dairen handles 5,000,000 tons of goods a year. The nucleus of the present Dairen port was constructed by the Russians at the cost of about 10,000,000 roubles. The South Manchuria Railway Company has taken up the work left incomplete, and had, up to the end of the fiscal year 1920, laid out the sum of 24,000,833. The Harbour improvement work, the construction of breakwater, and the reclamation work have not yet been completed according to the programme. At present, the total berthing accommodation is put roughly at 200,000 tons at a time.

The total length of the quay line is about 13,477 ft.

In the Dairen Wharf compound, there are 73 warehouses and goods sheds, comprising the total floor area of 78,892 *tsubo* in addition to the open storing ground of 235,000 *tsubo*. The aggregate storing capacity consists of 250,000 tons under cover and 200,000 tons in the open.

The vessels having access to the Dairen Wharves have increased annually, and in the fiscal year 1920, they totalled 2,944 ships amounting to 5,292,239 tons.

The following regular steamship lines either radiate from Dairen or have Dairen among the ports of call.

		Steamers	
1) Toyo Kisen Kaisha,	North American Line,	2	Once monthly
		6	Twice monthly
Osaka Shosen Kaisha,	Osaka-Dairen Line,	4	Twice weekly
Nippon Yusen Kaisha,	Yokohama-North China Line,	3	Three times weekly
South Manchuria Railway Company,	Dairen-Tsingtao-Shanghai,	1	Once every nine days
Dairen Kisen Kaisha,	Dairen-Antung	2	6 times a month
	Dairen-Tientsin	2	6 times a month
	Dairen-Canton (cargo)	1	Once monthly
	Dairen-Manila	1	Once monthly
	Dairen-Lungkou	1	6 times a month
	Dairen-Tsingtao	1	4 times a month

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		Steamers	
Chosen Yusen Kaisha,	Dairen-Tsingtao-Chemulpo	1	3 times a month
Towa Kisen Kaisha,	Dairen-Lungkou	1	5 times a month
Awa Kyodo Kisen Kaisha,	Dairen-Tsingtao	1	5 times a month
	Dairen-Chemulpo	1	3 times a month
Chingkee (Chinese)	Dairen-Chefoo	2	12 times a month

PORT OF YINGKOU (Newchwang). The port of Yingkou (Newchwang) is situated on the right bank of the Liao River, 14 miles above the mouth of the River.

The wharfage is located along the River bank, the water being 30 ft. deep. However, as there is the bar near the mouth, ships drawing more than 17 ft. are to navigate the River on the flood tide only. When the water goes down, so much is taken off the navigable facility of the Port; but when a flood occurs, the River beds get altered; and these peculiarities throw the construction of a permanent wharf out of the question.

The chief drawback of the port lies in its remaining ice-bound for nearly four months from December to the ensuing March. The shipping traffic of the port has been on the decrease. The figures for 1920 were 61 ships of 50,962 tons, which, compared with those for 1913, are 210 fewer in the number of ships and 72,959 tons less in tonnage.

The navigable facility of the Yalu River flowing on the Manchuria-Korean frontier is not so large as that of the Liao River, but it has been utilized from early times for carrying downstream Beans, kaoliang, wild cocoons, and Yalu timber to Antung from the Upper Yalu.

Still the Liao, together with the Sungari and the Amur are playing an important role as trade channels in the interior of Manchuria.

In fact, prior to the advent of the railways, these three Rivers used to serve as the only means of transportation. When they get frozen over in winter, the surface by the ice turns to a highway for leaded carts facilitating the transport traffic.

COMMUNICATIONS. The communication systems in Manchuria consist of those installed by the Chinese Government and such as have been by the Japanese authorites in the Kwantung Leased Territory and the South Manchuria Railway Area. The Chinese Postal administration has earned a reputation for comparative efficiency.

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The Japanese communications systems are under the control of the General Post Office of the Kwantung Government.

The following will give a resume of how the telegraphic and telephonic situation stood in 1918:—

Telegraphic Lines.

	Milege	Total length of lines
In Kwantung Leased Territory	148 miles	978 miles.
Outside Leased Territory...	498 „	4023 „
Total	646 „	5001 „
In 1920:	708	13,079

Telephonic Lines.

	Milege	Total length of lines
In Kwantung Leased Territory	271 miles	2188 miles.
Outside Leased Territory	638 „	5583 „
Total	909 „	7771 „

Chinese post offices are maintained at almost every town outside the Kwantung Leased Territory, and, as already stated, is credited with a fair amount of efficiency.

Chinese telegraphic services, too, connect the Prefectural Governments with the Provincial Government and with one another among the former, excepting a few Prefectures in the remoter parts of Kirin and Heilungkiang Provinces. The total mileage may be placed in the neighbourhood of 3,000 miles.

Then telephone service is maintained at Fengtien (Mukden), Yingkou, Kirin, Harbin, and other cities and towns of less importance.

X. Administration.

INDUSTRIAL INSTITUTIONS. The Ministry of Agriculture and Commerce Peking, looks after all the industrial institutions in China. The Ministry has four Bureaus of the Agriculture & Forestry, the Industry & Commerce, the Mining Administration, and the Fishery and Stock Farming.

In the Provincial Governments of Manchuria at Fengtien, Kirin, and Tsitsihar, and also the Military Governments of Jehol and Chahar in Inner Mongolia, each has the Board of Industry which, under the directions of the Provincial Governor, attends to all the affairs concerning the Provincial industry.

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Again, under the direct control of the Ministry of Agriculture and Commerce, there is the Forestry Office for Manchuria at Harbin, and the Mining Inspectors' Office at Changchun. The former is engaged in the investigation of the nationalized forests in Manchuria and attends to their management and disposal. The latter has charge of all the affairs concerning the mining.

These industrial institutions may mostly be called conservative.

On the Japanese side, the Kwantung Gevernment, Ryojun (Port Arthur) has the Industrial Department among its more important units. The South Manchuria Railway Company, too, has the Industria Office under the Local Administration Department. Each has been laying out a considerable sum of money for pursuing a positive policy in the experiment, investigation, and encouragement of agriculture, forestry, stock-farming, sericulture, and commercial and industrial enterprises, and they have had satisfactory results.

MEDIUMS OF COMMUNICATIONS. The central directing agency of the means ot communications in China is the Ministry of Communications, Peking. The Directorate General of the Government Railways forms part of the Ministry, and thereunder lie the Head Office of the Peking Mukden Line at Tientsin, that of the Kirin-Changchun Railway at Changchun, and that of the Ssupingkai-Taonan Railway at Ssupingkai.

The General Offices of the South Manchuria Railway Company are located at Dairen.

The Postal, Telegraphic, and Telephonic systems lie under control of the Director-General of Posts, Peking. The offices of the Postal and the Electricity Administrations are at Fengtien (Mukden).

The Postal Administration for Manchuria has under it five Post Offices and 114 branch post offices and 272 postal agencies. The last mentioned agencies include a good number of private postal agencies which undertake to perform the additional duties of Government agencies.

Under the Electricity Administration for Manchuria, there are maintained branch plants at the seats of the Prefectural Governments and other towns of importance. Such plants number 40 in Fengtien Province, 22 in Kirin Province, and 18 in Heilunkiang Province, totalling 90.

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The Postal Administration at Fengtien (Mukden) is organized with the following :—

	branch offices	agencies
Mukden postal administration	47	84
Newchwang District	11	11
Harbin „	23	50
Kwanchengtzu „	24	110
Antung „	9	17
Total...	117	272

The General Post Office of the Kwantung Government is at Dairen and controls the postal, telegraphic, and telephonic business in the Kwantung Leased Territory and the South Manchuria Railway Area.

Taxation system. There is the Ministry of Finance at Peking. Every Province has the Board of Finance, under which Tax-Collectors offices are located at different points, with branch offices where necessary.

The principal kinds of taxes are land tax, revenue stamp tax, fishery tax, registration tax, production tax, tabacco tax, liquor tax, live stock tax, license tax, timber tax, cocoon and silk yarn tax, junk tax, cereal tax, mining tax, etc.

Sat gabelle and Customs duties, etc., are not included in the above.

It would be too much for this pamphlet to take up the detail of each tax.

To cite an instance, the privately-owned land tax is levied usually on the following lines :—

	in large dollars per *mow*	surtax, 10% of principal tax.
Fine land	1.40	0.14
Intermediate land	1.00	0.10
Poor land	0.60	0.06
Sandy or alkaline land	0.30	0.03
Nondescript land	1.00	0.10

Remarks :—A fee of 5 sen is collected per item. S.¥1.20 in Chinese small silver coins is accepted for S.¥1 in large dollars.

As regards Salt Gabelle, S.¥2 in large dollars is collected; in revenue stamp tax, 1% is collected per S.¥1 and over; and 2% for S.¥10 and over.

As to Fishery tax, it is imposed according to the kinds of nets used to an amount ranging from S.¥1 to S.¥50. S.¥2 is taxed for a fishing boat, and S.¥2.40 for every fisherman. In the registration of real estate transferred, 9% of the price at which the property has been sold is collected; for a loan service, 6%.

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of the loan amount is levied; as production tax 1% *ad valorem* of the cereal produce is taxed; for general goods, 1½% is taken; for consumption tax 2%; as tobacco tax, S.¥1.60 is collected per 100 *kin* of leaf tobacco and for every 10,000 cigarettes; as liquor tax, S.¥1.60 is charged per 100 *kin* of shumshu, and 80 sen for *huangchiu*; for live stock sold, 5% of the sales price is taken for cattle, horses, and mules; 2½% for donkeys, and 2% for pigs; cocoon and silk yarn tax is levied also *ad valorem* at the rate of 1½% as production tax and 2% as consumption tax.

The above comprise only the principal taxes and there are of course surtaxes and other supplementary taxes.

WEIGHTS AND MEASURES. The weights and measures are manufactured at the Weight & Measure Works in the Ministry of Agriculture & Commerce, Peking. The standard weights and measures have been fixed by the existing laws of the Chinese Government.

Compared with the Japanese standards, the Chinese weights and measures are as under:—

	Chinese	Japanese
Lineal Measure:	1 (寸) *tsun* = 10 *fen*	1.056 *sun* (寸)
	1 (尺) *chih* = 10 *tsun*	1.056 *shaku* (尺)
	1 (丈) chang = 10 chih	1.056 *jo* (丈)
	1 (里) li = 1800 chih	1.900 *shaku* (尺)
Cubic Measure:	1 (勺) shao = 10 (才) tsai	5.7401 *sai* (才)
	1 (合) ho = 10 shao	5.7401 *shaku* (勺)
	1 (舛) sheng = 10 ho	5.7401 *go* (合)
	1 (斗) tou = 10 sheng	5.7401 *sho* (舛)
	1 (石) tan = 10 tou	5.7401 *to* (斗)
Weight:	1 (錢) *chien* = 10 *fen*	9.9444 *fun* (分)
	1 (斤) chin = 160 *chien*	159.1104 *momme* (匁)
Area:	1 (畝) mow = 10 *fen*	185.856 *tsubo* (歩)

Lineal Measure: 1 *shaku* (尺) is approximately equal to 1 foot

Cubic Measure: 10 *to* (斗) or 1 *koku* (石) is equal to 4.63 bushels.

Weight: 120 *momme* (匁) make 1 lb.

Area: 1 *tsubo* (歩) is equal to 36 sq ft.

The above are as laid down by the existing statute laws of China, but in many cases, the old systems are still retained in force. These systems vary according to places, as may be seen from the following table.

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The following table gives the varying equivalents of the Japanese standard weights and measures at different places in Manchuria:—

	lineal measure (for native cloth) 1 Chinese chih (尺)	lineal measure for import silk & cotton cloth 1 Chinese chih (尺)	lineal measure for surveys & timber 1 Chinese chih (尺)
Dairen	—	1.140 *shaku* (尺)	—
Yingkou	2.075 *shaku* (尺)	—	1.040 *shaku* (尺)
Antung	—	1.130 *shaku*	1.020 „
Fengtien (Mukden)	1.750 *shaku*	1.140 „	1.050 „
Kaiyuan	2.075 „	1.154 „	—
Liaoyang	1.842 „	1.147 „	1.050 „
Changchun	1.663 „	1.150 „	1.045 „
Kirin	—	1.150 „	1.050 „
Shuangchengpu	—	1.140 „	1.045 „
Ningan	1.886 „	1.147 „	1.032 „
Suihua	—	1.180 „	1.080 „
Ilan	—	1.151 „	1.045 „
	1 Chinese *sheng* (升)	1 Chinese *chin* (斤)	
Dairen	1.652 *sho* (升)	1.52 *kin* (斤)	
Yingkou	1.405 (for junk cereals) 1.455	1.45	
Antung	1.75	1.55	
Fengtien (Mukden)	1.300 1.342	1.488	
Kaiyuan	1.52	1.56	
Liaoyang	1.919	1.419	
Changchun	1.630	1.472	
Kirin	1.280	1.530	
Shuangchengpu	1.530	1.390	
Ningan	2.059	1.470	
Suihua	1.400	1.360	
Ilan	1.530	1.440	

SURVEY OF LAND. In all surveys of land in Manchuria, the lineal measure for surveys and timber above mentioned is used. 5 *chih* square is called 1 *kung* (弓), and 240 *kung*, 288 *kung*, and 360 *kung* make 1 *mow* (畝) according to different districts, being often called respectively small *mow*, intermediate *mow*, and large *mow*, 6 *mows*, or sometimes 10 *mows* are called 1 hsiang (晌). It is said that the hsiang of 6 *mows* applies to the old Manchu estates, and that of 10 *mows* to privately owned land. 45 *hsiang* make 1 *fang* (方).

It may be added that the Chinese Government goes by the small *mow* of 240 *kung* and the *hsiang* of 10 *mows*.

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MANCHURIA ENLIGHTENING SOCIETY.

Whose Organ the "Light of Manchuria" is.

What actuates us in our endeavours to open up Manchuria and Mongolia lies in realizing our ultimate ideal in the enlightenment and development of Manchuria and Mongolia. It will not do only to develop the natural and industrial resources, but the ethical and intellectual culture of the inhabitants must also be carefully husbanded and nourished, so that both mind and matter may be developed in harmony.

The Manchuria Enlightening Society raised its first cry in order to fill a sorely felt need. Its primary mission is to investigate and propagate the truths of the development of Manchuria and Mongolia. We shall studiously refrain from misleading the public by disseminating inaccurate or exaggerated reports, but shall steadfastly adhere to the truth or facts only.

It is urgently important that the truths regarding Manchuria and Mongolia should be made known clearly not only to Japan and China, but also to Europe and America. On this account, the establishment of the Manchuria Enlightening Society is bound to have a serious significance of international character.

If happily, through the establishment and activity of this Society, the truths of the development of Manchuria and Mongolia should become topics of world wide interest, it would not be only an honour to those now actively engaged in developing these regions, but also a matter of congratulation to the world at large.

We might be permitted to add that the ultimate ideal and desire of this Society are to serve as the herald of all enlightening movements in future, thereby opening a new chapter in the annals of the world's civilization.

What is the Society Like.

a) Office.—The office of the Society is in the Municipal Office Building on Central Circle in the city of Dairen.

b) Society's Work.—The works of the Society include the following:—

1. Publication of the organ of the Society, The "Light of Manchuria."

2. Supply of general information through the Socitey and by other means, giving the results of such investigations and researches as may be conducted in the interest of the development of natural, industrial, and other resources in Manchuria, Mongolia, and Eastern Siberia.

3. To act as guide to intending investors in general in all kinds of enterprises in Manchuria, etc., and also to undertake any special investigation or research on application by promoters of all kinds.

4. To offer facility to travellers on inspecting visits to Manchuria, Mongolia, Siberia, Chosen (Korea), China, etc., to the end of importing accurate information and rendering their observations as close to truth as possible.

5. To use all kinds of means in order to propagate the true conditions obtaining in Manchuria, etc., and further to carry on the propaganda work for these regions through the medium of lecture meetings, exhibitions, etc.

6. To compile, publish, sell, and distribute books, pamphlets, etc., bearing on Manchuria and Eastern Siberia.

7. To carry on other works necessary for disseminating information on Manchuria, etc., and also for fostering economic enterprises therein.

c) In carrying on the above work, the Society is divided into the following:—

Secretariate,
Research Department,
Publication Department,
Intelligence Department, and
Accounting Department.

d) Any one wishing to join the Society is requested to send in a written application, giving the name and address, accompanied with the

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membership fee for not less than three months paid in advance.

e) The membership fee, entitling the member to a copy of the monthly organ, costs 50 sen (½ yen) per month and ¥6 per annum.

Remittances.

All remittances to this Society may be made most conveniently and safely to Transfer Savings No. 2850, Dairen. No receipts for the same will be issued, but instead the Society's monthly organ will be sent.

Officials.

Baron S. Goto (Mayor of Tokyo), President.

Mr. S. Nakanishi (ex-Vice-President, South Manchuria Railway Company), Chairman;

Mr. Y. Aioi (Chairman, Chamber of Commerce, Dairen), Vice-Chairman;

Dr. George Matsumoto (Vice-President, South Manchuria Railway Company).
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Mr. H. Kasahara, Secretary.

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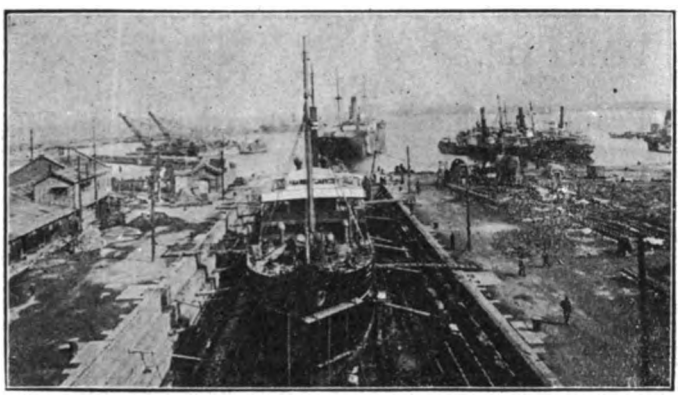

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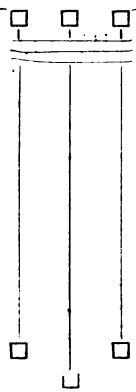

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THE
LIGHT OF MANCHURIA

Bean Oil as Merchandise.

By Mr. M. Nakao & Mr. S. Ikebe (of the General Laboratory of the South Manchuria Railway Co.)

Introduction.

Bean Oil is made from Soya (Manchurian) Beans (Glycine hispida Maxim) which originated in China and have been transplanted in Japan, Chosen (Korea), India, etc.

Manchuria is highly suited to the cultivation of Beans and produces them in immense quantities. Though difficult to give exact data, the aggregate production in Manchuria is estimated at between 12,000,000 and 18,000,000 *koku* (1 *koku* being equivalent to 4.96 bushels). Half this production is consumed by the bean mills, and the bean oil obtained therefrom is exported abroad. What Beans are consumed at Dairen for this purpose amounts to some 500 tons a day.

Beans and their products are called the Staple Products of Manchuria, and Bean Oil especially is rising as an important article of world wide merchandise.

Naturally, the study of Beans as a merchandise, how to improve their breeds and to unify them, and how to foretell deterioration in quality while under storage are considered as matters of great interest and importance. The authors have been engaged in the study of these problems, but have not yet been able to complete them.

What is given in this article is only part of the results of their investigations.

Kinds of Beans and Bean Oil.

The quality of Bean Oil depends on the kinds of Beans, from which it is made, and also how oil is obtained from the Beans.

The Soya (Manchuria) Bean has 214 species, which may be grouped under the following heads:—

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Hairy.
Hairless:
1. Flat
2. Roundish
   a. Yellow
   b. Green
   c. Black
   d. Brown
   e. Greenish-Yellow
   f. Spotted

These may be classified according to their colours and their ingredients may be tabulated according to the results of analysis as follows:—

	Oil	Albumen
Deep blue	19.20%	45.55%
Blue	18.79%	43.13%
Light bluish yellow	20.81%	40.25%
Bluish yellow	19.95%	40.45%
Yellow	19.88%	42.54%
Whitish yellow	19.93%	41.81%

The above will show that the light bluish yellow kind contains the highest percentage of oil, and the blue kind the lowest percentage. All the yellowish kinds have much the same percentage of oil.

Again, the results of analyses held over the various kinds of Beans dealt in on comparatively large scales on the Manchurian markets also confirm the above table in showing that the yellowish kinds contain the highest percentage of oil, and the blue kinds lower percentages, the black varieties giving the lowest percentage. Allowances must be made for more or less variation according to the difference in places of production and in time of analysis. However, generally speaking, the yellowish kinds are the commonest and, at the same time, may be said to yield the greatest percentage of oil.

The results of the analysis are as under:—

Beans	Moisture	Crude albumen	Crude fat	Hydrocarbon	Crude fibre	Ash
Whiteeyed...	... 9.87	37.23	9.37	24.03	5.11	4.39
" ...	... 12.34	37.35	17.59	23.36	5.12	4.36
Chinyuan (靑)	... 9.70	37.74	19.33	24.41	5.05	4.77
Blackeyed...	... 10.90	37.51	19.64	23.12	5.11	4.53
Yellow ...	... 9.11	39.90	17.59	24.27	4.92	4.21
Blue	... 12.64	36.47	16.23	25.08	4.89	4.69
Black... ...	... 10.74	35.32	15.80	24.43	5.96	4.00

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Expression of Oil and Bean Oil.

Formerly, Bean Oil, although in a small quantity, was used as a source of light, a greater portion having been used for cooking purposes, mixed with sesamum oil.

In such times, native mills on small scales could fill the local wants. But, since the utilization of Bean Cake as maoure was discovered, the bean mills chose the manufacture of Bean Cake for the primary object, making Bean Oil a mere bye-product.

However, as Bean Oil exploited an extensive market in Europe and America, the Oil and the Cake have now come to have an almost equal market demand.

The method of expressing oil may be divided into two kinds, viz. the expression and the extraction method.

RECEPTACLES OF BEAN OIL IN DAIREN MILL COMPOUND.
DRUMS, TIN CANS, & BASKETS.

I. Expression Method.

The expression method may be subdivided into three kinds; viz., the wedge method, the screw method, and the hydraulic pressure system.

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(a) Wedge Method.

The wedge method has been in use in China from early times. A wedge is employed to express the oil from Beans by hand. It is a primitive method, and takes a long time for the expression. It is said that by this method, a comparatively large quantity of oil containing a less quantity of impurities is obtained.

(b) Screw Method.

In this method, the screw takes the place of the wedge to save labour.

(c) Hydraulic Pressure System.

The hydraulic pressure system is the most advanced of all the three. Mills operated on this system are said to be on the increase.

II. Extraction Method.

In the extraction method, a solvent is used for the extraction of oil from Beans. By this method, the largest percentage of oil is obtained. However, the oil procured by this system is of a different colour from what is obtained by expression, and is dealt in separately.

The extraction process extracts almost the whole of oil in Beans, whilst the expression process leaves nearly half the oil in Bean Cake.

The following table will be of some interest:—

	Bean Cake	Bean Plate	Bean Meal
Shape	round	oblong	in meal
Principal Mills	Everywhere in Manchuria	Kabalkin Mill, Harbin	Suzuki Mill, Dairen
Maximum pressure per square inch of surface	600-700 lbs.	1,700-2,200 lbs.	By benzine extraction
Oil percentage to Beans	9-10%	11.5-12.5%	14-15%
Oil left in residue.....	7-9%	5-7%	2.5-3.0%
Moisture contained in residue.	12-19%	10-13%	4-13%

Indices of Bean Oil (Produced in Manchuria).

The study of Bean Oil has become popular with the increase in demand. There are a good number of books and articles written on this subject. However,

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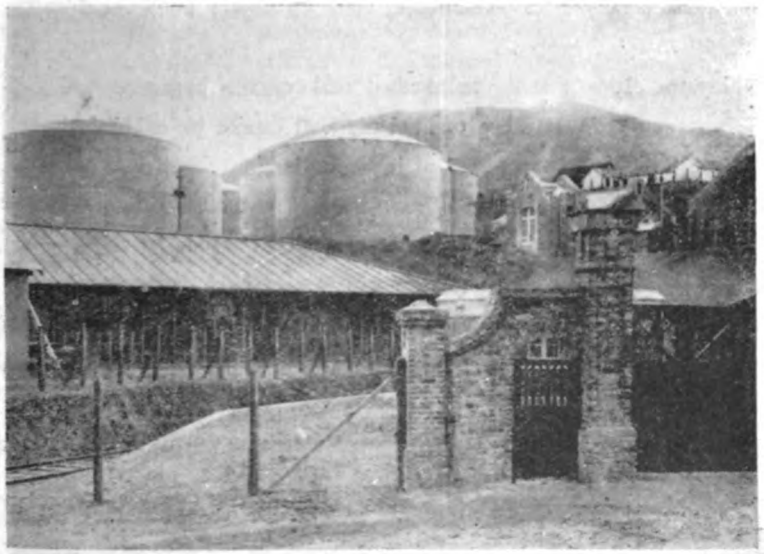
they give the results of investigations made into the composition of Beans and also their utilities.



BEAN OIL TANKS OF DAIREN BRANCH, MITSUI BUSSAN KAISHA.

A thorough study of Beans as a commodity has not yet been published. The following is a list of some of the more interesting writings on Bean Oil:—

Tsujimoto (in Vol. VII of 1904, Report of Industrial Chemical Society.)
Kametaka (in Vol. XXVII of 1906, Report of Tokyo Chemical Society.)
Nishiyama (in Vol. XI of 1908, Report of Industrial Chemical Society.)
Uyehata (in No. 1, 1910, Report of S. M. R. Co. Central Laboratory.)
Keimatsu (in Chem. Zeit, 1911, 8, 39.)
Okada (in Vol. 1, 1913, Report of S. M. R. Co. Central Laboratory.)
Nishiyori (in Vol. V, 1916, Report of S. M. R. Co. Central Laboratory.)
Sato (in Report of Industrial Chemical Society, 1919.)
Tanaka (in Report of Industrial Chemical Society, 1919.)
Uyeno (in No. 9, Report of Industrial Experimental Institute.)
Morawski and Stingl, De Negri, Fabris, and Schukoff.
W. Korentschewski and Zimmermann; Chem. Zeit. 1905.
Meister; Chem. Rev. 1910.
C. Oettinger and F. Buchta; Zeit. & Augen. Chem. 1911.
H. Matthes and A. Dahl: Tourn. Soc. Chem. Ind. 1911.
L. Settimi. Ann. Lab. Gabella. 1912-1913.
Brightmann; Jon. Soc. Chem. Ind. 1919.
Charter A. Newhall; J. Ind. Eng. Chem. 1920, etc.

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In the above works and articles, Matthes and Dahl say that Bean Oil contains 94·95% of fatty acid ester, of which about 15% is saturated fatty acid, and about 80% unsaturated fatty acid. Olein acid takes up 70%; linolic acid 20%; and linolenic 6%.

Nishiyama claims that the unsaturated acid contains hypogene acid.

Keimatsu says the presence of linolenic acid cannot be established.

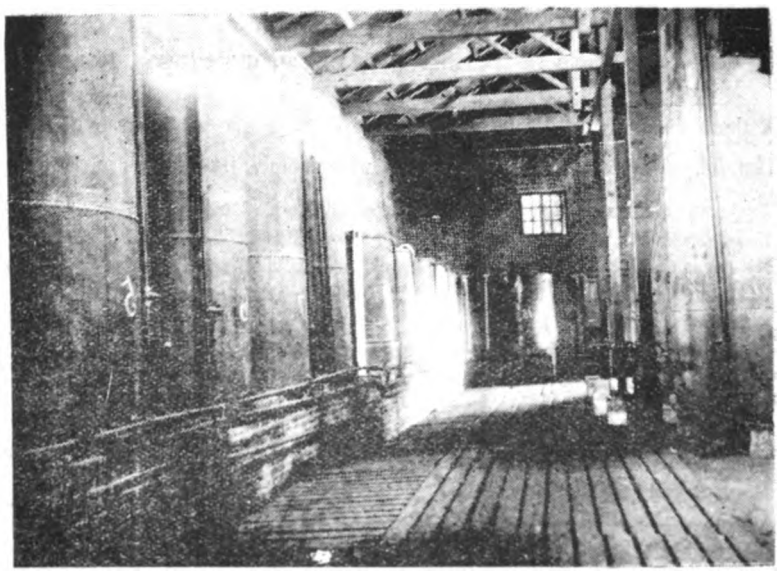
Tsujimoto doubts the presence of hypogene acid.

Of Bean Oil, the percentage of non-saponifiable matter seems to widely vary according to places of production and oil-expressing methods.

Dr. Riegel says that 0.15% of lechchin is contained.

We have quoted above only a few fragments of the results of the ingredients of Bean Oil. They cannot be accepted as applicable to the quality of Bean Oil produced in Manchuria.

Especially, as to the indices ascribed to Manchurian (Soya) Bean Oil, opinions have differed.



OIL TANKS INSIDED AIREN MILL.

The indices given by Mr. Uyehata finds disagreement. Messrs. Tsujimo and Mitsumaru aver that the value of Manchurian Bean Oil has been set too high.

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The following is a table indicating the indices of the respective authors including our own :—

	Tsujimoto	Nishiyama	Keimatsu	Morawski & Stingl	De Negri & Fabris
	(15°)	(15.5°)	(15°)	(15°)	(15°)
Specific gravity	0.9256	0.9242	0.9265	0.9270	0.9242
Freezing point	—	17° below zero	15°-16° below zero	—	8°-15° below zero
Saponifying value	192.6	192.4	190.0	192.9	192.5
Iodine value	132.5	134.4	132-135	122.0	121.3
Hehner value	95.7	95.1	94.2	95.5	—
Reichert Meissl value	7.29	0.55	—	—	—
	—	96.0	—	—	59.0
	20°	20°	Viscosity		
Refractive value	1.4755	1.474	9.0	—	—
	20°		Engler degree		
Butter refractometer	75.2	—	—	—	—

	Oettinger & Buchta	Mathes & Dahl	Authors	Authors	Authors	Authors
	15°	15°	15°	15°	15°	15°
Specific gravity	0.9246	0.9240	0.9279	0.9289	0.9267	0.9278
Freezing point	8°-16° below zero	11.5° below zero	—	—	—	—
Saponifying value	192.4-194.0	192.3	190.0	191.0	192.3	190.8
Iodine value	132.9-135.0	131.3	131.8 Wijs method	132.0	137.7	134.8
Hehner value	95.8-96.0	94.07	—	—	—	—
		Acid value	Acid value	Acid value	Acid value	Acid value
Reichert Meissl value	0.45-0.59	0.75	0.57	0.72	0.18	0.09
	—	—	—	—	—	—
	(20°)					
Refractive value	1.47	—	Viscosity (Redwood) degree	Viscosity (Redwood) degree	Viscosity (Engler) degree	Viscosity (Engler) degree
	50-1.4755	—	274 (25°)	274 (25°)	8.43 (25°)	8.26 (25°)
Butter refractometer	—	—	72.5	72.5	71.8	71.8

The indices given in the above table have been obtained from only a few samples employed for experimental tests and furnish only a general idea. On this account, they are felt to be some what inadequate indices for all the kinds of Manchurian Bean Oil appearing on the market.

Accordingly, in March, 1921, of three hundred odd bean mills at Dairen and along the South Manchuria Railways, 140 of the more important mills were selected,

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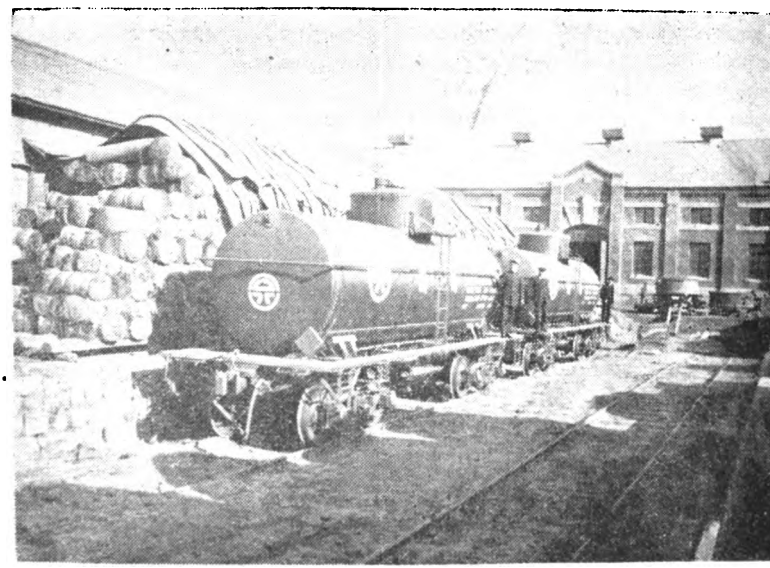
and samples of ordinary Bean Oil put out at these plants were procured and were subjected to a general test, particular attention being turned to the colour of the oil, which had hitherto been left neglected. This was done because as an article



OIL TANK CARS IN NISSHIN OIL MILLS COMPOUND.

of merchandise, the colour standard must be observed, apart from the uniformity of quality from a chemical standpoint.

Especially, in the tests to be passed on Bean Oil imported into America, its colour forms an item of importance. It is laid down that no Bean Oil shall be darker, when 5¼ inch deep, than the mixture of either yellow (70) and red (8.0) or yellow (70) and red (9.0) of the standard coloured glass.

As may be noted from the undermentioned table, Bean Oil manufactured at bean mills in Manchuria seldom meets the above standard requirements. This point is held by us as one which calls for the serious study of the bean mill owners.

In the table below, no names of the bean mills are given, they being only numbered.

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	Specific gravity 15° C.	Free fatty acid	Saponifying value	Iodine value	Colour yellow	Colour red
0	0.9268	0.140	191.0	132.7	35.0	8.2
1	0.9283	0.247	192.0	135.8	37.0	7.2
2	0.9292	0.367	191.2	133.8	87.7	8.2
3	0.9289	0.310	190.1	133.5	38.0	8.0
4	0.9299	0.296	191.1	131.8	81.0	7.6
5	0.9312	1.270	190.3	133.1	40.0	8.6
6	0.9277	0 212	191.2	134.1	58.0	6.2
7	0.9306	0.325	191.9	133.8	79.0	7.6
8	0 9296	0.409	190.2	133.5	49.0	6.2
9	0.9297	0.353	191.7	133.5	52.0	6.8
10	0.9300	0.282	190.8	131.6	63.0	7.8
11	0.9289	0.278	190.0	132.1	50.8	6.6
12	0.9289	0.296	192.2	131.6	67.0	7.8
13	0.9286	0.416	190.8	131.0	66.8	7.6
14	0.9270	0.296	192.0	132.0	43.0	6.0
15	0.9296	0.305	190.0	133.8	24.0	6.4
16	0.9278	0.282	193.0	132.4	48.0	6.4
17	0.9267	0.367	188.6	133.8	37.0	6.4
18	0.9262	0.353	191.0	131.5	48.0	6.4
19	0.9258	0.240	191.9	130.0	37.0	6.6
20	0.9277	1.073	193.4	134.1	23.0	5.7
21	0.9300	0 316	190.2	132.5	48.0	7.6
22	0.9289	0.332	190.2	133.5	58.0	7.6
23	0.9265	0.373	189.7	132.1	45.8	5.6
24	0.9280	0.373	191.9	132.1	79.5	9.0
25	0.9289	0.622	192.0	135.8	62.8	7.0
26	0.9288	0.221	191.4	134.5	45.0	6.6
27	0.9277	0.359	193.3	134.1	28.0	5.4
28	0.9270	0.203	192.2	134.1	50.3	6.4
29	0.9269	0.802	191.8	132.3	71.0	9.0
30	0.9266	0.235	194.9	133.6	25.0	6.4
31	0.9279	0.332	193.2	135.0	40.6	6.0
32	0.9275	0.297	192.2	134.2	59.5	6.6
33	0.9280	0.788	192.3	132.6	28.0	8.2
34	0.9277	0.249	193.0	133.9	82.0	5.4
35	0.9266	0.415	189.0	134.6	43.0	8.2
36	0.9255	0.221	192.7	134.2	43.0	7.0
37	0.9254	0.318	193.8	135.9	54.8	6.6
38	0.9289	0.941	193.7	135.0	55.0	8.0
39	0.9275	0.401	195.2	133.8	55.0	8.0
40	0.9264	0.304	183.9	134.1	40.0	6.0
41	0.9270	0.359	194.1	134.4	58.0	6.6
42	0.9257	0.359	193.0	134.4	51.0	5.4
43	0.9276	0.249	193.8	134.4	50.0	5.4
44	0.9267	0.512	194.2	137.8	83.0	6.2
45	0.9285	2.782	194.0	130.5	55.0	12.0
46	0.9274	0.484	195.7	134.4	109.0	1.6
47	0.9273	0.650	194.1	135.0	91.5	8.0
48	0.9283	0.871	191.9	131.0	48.8	9.6
49	0.9272	0.346	190.1	135.7	38.0	6.0
50	0.9297	0.539	190.1	134.1	48.8	6.8

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	Specific gravity 15° C.	Free fatty acid	Saponifying value	Iodine value	Colour yellow	Colour red
51	0.9272	0.277	190.3	134.8	83.0	7.2
52	0.9278	0.415	191.0	134.3	75.0	7.6
53	0.9276	0.249	190.4	135.5	61.0	7.2
54	0.9267	0.373	190.4	133.2	48.0	6.8
55	0.9270	0.837	193.5	135.7	57.0	6.8
56	0.9257	0.415	189.4	134.0	39.0	6.4
57	0.9265	0.443	190.8	133.8	80.4	6.4
58	0.9280	0.221	190.1	134.2	64.8	6.0
59	0.9262	0.235	190.1	135.6	51.0	5.6 blue 1.0
60	0.9266	0.207	190.2	140.0	68.0	4.6
61	0.9282	0.207	190.2	130.0	54.0	5.0
62	0.9273	0.207	189.8	136.0	63.0	5.2
63	0.9262	0.263	188.9	137.9	32.0	6.6
64	0.9264	0.263	188.4	133.8	54.0	5.2
65	0.9262	0.263	189.9	139.0	73.0	6.4
66	0.9255	0.207	191.0	137.9	30.6	5.4
67	0.9254	0.194	193.8	136.0	82.0	5.6
68	0.9262	0.235	192.8	135.8	81.0	5.2
69	0.9269	0.263	191.0	136.7	58.0	7.2 yellow 4.0
70	0.9268	0.318	190.2	136.4	110.5	6.4
71	0.9266	0.332	191.0	136.7	118.7	4.7
72	0.9260	0.290	190.6	133.6	161.0	3.0
73	0.9272	1.936	190.3	134.2	110.5	7.6
74	0.9270	0.318	190.0	138 1	68.0	4.1
75	0.9273	0.346	190.2	140.0	57.5	5.0
76	0.9270	0.387	190.0	136.0	42.0	5.2
77	0.9282	0.512	189.8	133.8	39.0	4.4
78	0.9265	0.249	189.7	131.7	28.0	3.6
79	0.9277	0.290	189.0	137.5	47.3	4.7
80	0.9277	0.346	190.4	132.0	187.5	8.6
81	0.9267	0.359	189.1	130.8	81.5	4.1
82	0.9270	0.443	193.4	137.8	142.5	4.3
83	0.9276	0.249	192.8	136.5	39.0	4.1
84	0.9270	0.346	190.7	132.0	72.5	4.1
85	0.9265	0.207	189.0	135.5	28.0	5.0
86	0.9264	0.277	190.5	137.2	28.0	4.9
87	0.9273	0.209	190.8	136.2	28.0	5.3
88	0.9267	0.194	191.0	136.0	25.0	5.4
89	0.9265	0.373	190.7	131.0	25.0	5.2
90	0.9267	0.290	190.0	133.2	26.0	5.2
91	0.9273	0.373	190.8	134.0	30.0	5.5
92	0.9274	0.526	190.3	134.8	28.0	5.5
93	0.9275	0.242	190.7	136.8	28.0	5.2
94	0.9265	0.221	189.8	134.5	29.6	5.0
95	0.9264	0.249	190.0	135.3	29.6	5.0
96	0.9287	0.387	190.2	132.8	39.0	5.8
97	0.9270	0.249	190.0	134.0	29.0	5.8
98	0.9263	0.263	189.8	133.0	29.0	5.6
99	0.9280	0.429	189.2	136.5	35.4	6.3

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	Specific gravity 15° C.	Free fatty acid	Saponifying value	Jodine value	Colour yellow	Colour red
100	0.9275	0.221	191.0	136.0	39.0	5.8
101	0.9267	0.423	189.8	136.0	39.0	5.6
102	0.9270	0.747	190.0	134.7	41.0	6.6
103	0.9262	0.277	190.0	135.2	41.0	6.4
104	0.9260	0.636	133.5	133.5	39.0	6.4
105	0.9264	0.581	189.4	133.7	37.0	5.6
106	0.9276	0.350	190.7	132.8	39.0	6.6
107	0.9269	0.263	189.0	134.0	34.0	5.7
108	0.9264	0.443	190.7	132.8	36.0	5.9
109	0.9267	0.373	192.1	135.2	36.0	5.7
110	0.9263	0.325	191.0	134.5	49.0	5.7
111	0.9264	0.194	190.0	132.0	39.0	5.6
112	0.9267	0.373	190.3	132.2	39.0	5.8
113	0.9265	0.207	189.6	130.9	25.0	5.5
114	0.9260	0.363	190.0	134.7	27.0	5.7
115	0.9268	0.277	190.0	135.9	29.0	5.8
116	0.9267	0.332	191.2	133.8	27.0	5.9
117	0.9270	0.194	190.0	134.8	27.0	5.6
118	0.9260	0.360	191.0	132.0	27.0	5.6
119	0.9272	1.176	190.7	134.0	37.0	5.8
120	0.9268	0.277	190.0	133.5	44.4	6.0
121	0.9267	0.443	193.8	135.9	43.6	6.0
122	0.9257	0.401	194.0	133.5	41.0	5.8
123	0.9268	0.194	190.0	136.0	37.0	5.8
124	0.9265	0.235	191.2	135.0	37.0	5.8
125	0.9264	0.249	190.0	136.0	37.0	5.8
126	0.9260	0.387	189.5	136.0	35.0	5.6
127	0.9273	0.214	191.9	139.4	37.0	6.0
128	0.9269	0.263	194.5	134.0	35.0	6.1
129	0.9204	0.353	190.0	135.9	3.90	6.8
130	0.9268	0.553	190.7	133.9	3.90	6.6
131	0.9273	0.290	191.2	139.2	4.40	6.6
132	0.9266	0.387	191.2	135.9	4.48	6.6
133	0.9269	1.321	190.5	137.0	4.40	6.6
134	0.9265	0.221	190.0	133.1	4.40	6.6
135	0.9265	0.318	190.0	137.7	68.0	6.0
136	0.9270	0.221	192.0	136.5	68.0	5.0
137	0.9275	0.692	190.2	136.2	68.0	6.0
138	0.9270	0.263	190.0	133.0	68.0	6.1
139	0.9264	0.207	190.0	135.0	89.5	5.6
140	0.9267	0.443	190.1	133.9	81.8	5.2
Special 1	0.9277	0.1798	192.25	137.75	19.5	1.55
Special 2	0.9278	0.0899	190.80	134.80	12.5	1.00

Remarks: The colour has been gauged by the Robibont tintmeter by comparing Bean Oil, 2 inches deep, with a mixture of standard coloured glasses (yellow and red). In the cases of a few samples, which had a shade of blue, blue glass was used.

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From the above table, it will be seen that

The maximum free fatty acid was	2.782
„ minimum „ „	0.140;
The maximum saponifying value was	195.8
„ minimum „	188.4;
The maximum iodine value was	140.0
„ minimum „ „	130.0;
The minimum specific gravity was	0.9254
„ maximum „ „	0.9299

All samples having such indices as mentioned just above cannot be regarded as ordinary kinds.

The general averages of all the samples enumerated in the foregoing table are as under:—

Specific gravity	0.9272
Free fatty acid	0.4011
Saponifying value...	191.40
Iodine value	134.44
Colour (2 inches deep); yellow	59.18
red	6.85

These figures give the general averages, which, in our opinion, may be accepted as the averages of the kinds of Bean Oil on the market.

As to the colour standards laid down by the United States, they seem rather severe for the Bean Oil now on the market, and appear more worthy of refined oil.

In fact, if more than two inches deep, the American colour standards would seem too dark.

Free Fatty Acid of Bean Oil.

Free fatty acid is looked upon as a factor of Bean Oil on the market as important as colour itself. The percentage of free fatty acid contained by Bean Oil influences the price. Especially, with export oil for abroad, the percentage of free fatty acid is feared to be prone to increase, while in transit.

Of course, the acid value of Bean Oil varies according to new or old Beans, from which it has been made, and also according to the length of time that has elapsed after the manufacture of Oil. This is admitted by all. The older the Beans are, the higher is the acid value. Messrs. Mathes and Dahl say (in Arch. Pa rm. 1911, 249. 424-435) that experience has taught that the moisture in the atmosphere raises the acid value.

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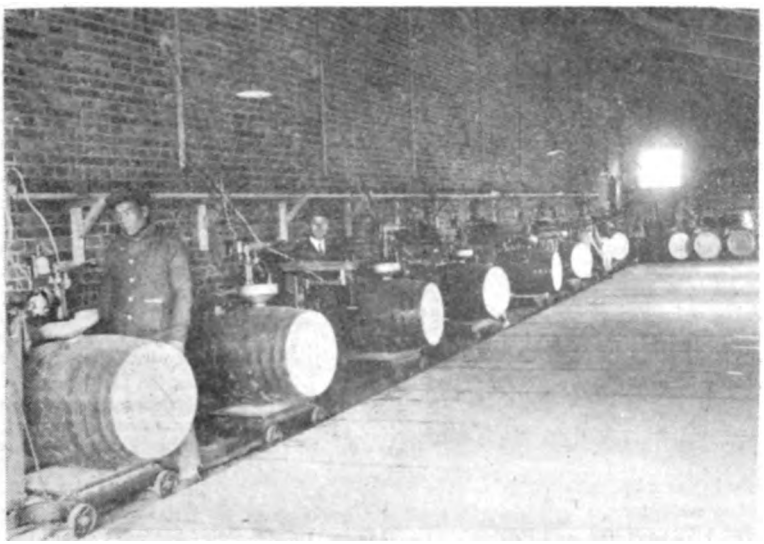
Again, Mr. Nishiyama says, in No. 11 of the Report of the Industrial Chemical Society in 1908, that exposure to the sun is found to increase the acid value of Bean Oil. The same author calculates the rate of increase as under :—

0.55% of acid value in Bean Oil rises to 1.01% on exposure to the sun for thirty days, and to 4.63% after ninety days.

The same author has then studied if the acid value increases or not because of the presence of residue in Bean Oil, and has learned that such presence produces little effect.

According to a report prepared in April, 1921, by the Kobe Branch of the Mitsui Bussan Kaisha regarding the investigation of the cause of deterioration of Bean Oil in quality, firstly, a sample of Bean Oil adulterated with 1% of impurity showed that the acid increased by 1.5944% in the course of fifty days, and also



FILLING DRUMS WITH BEAN OIL AT DAIREN MILL.

that the rate of increase rose higher till the lapse of forty days; secondly, when mixed with 1% of sea water, the increase of acid was noted to be 0.479% in the course of fifty days; thirdly, when mixed with 1% of freshwater, the increase of acid was 0.3948% in the course of thirty days; fourthly, when exposed to the sun, the percentage of increase was 0.1128 in the course of twenty days.

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The degree of acidification among the above four cases was in the order mentioned, and in the fourth case, but little effect was discernible.

The authors subjected samples of Bean Oil manufactured afresh at the factory of the Dairen Oil & Fat Industry Co., Dairen, the qualifications of which were as follow, to the undermentioned tests:—

Specific gravity 0.92 at 15° C; free fatty acid 0.143%; saponification value, 190.7; iodine value 132.2; moisture, 0.173%.

When oil is filtered, free fatty acid is put at 0.14%.

These samples were left in different conditions as designated below for thirteen weeks, the free fatty acid having been examined and measured once a week in the meantime.

	Maximum free fatty acid	Rate of increased acid	Progress
Crude oil (2 litres) (Stored in the dark)	0.1936	3.68	No increase of acid noticed after the fifth week.
Filtered oil (2 litres) (Stored in the dark)	0.1936	3.68	" " "
Crude oil (exposed to the sun)	0.2079	4.93	The weather conditions prevented a regular examination and measurement, but after the tenth week, no increase of acid was observed.
Crude oil (500 c.c.) (Stored in exsiccator)	0.1798	2.84	Acid increased very slowly, ceasing to increase after the ninth week.
Filtered oil (500 c.c.) (Stored in exsiccator)	0.1798	2.84	" " "
Crude oil (500 c.c.) (Stored in exsiccator saturated with moisture)	0.2628	8.79	From about the fourth week, the oil began to thicken from the surface; this became more pronounced in the thirteenth week, the increase of acid going on incessantly.
Filtered oil (500 c.c.) (Stored in exsiccator saturated with moisture)	0.2766	9.41	As above mentioned.
Crude oil (2 litres) (Stored in a heated room from 50 c to 60 c)	0.3100	12.16	In a day, most of the precipitation became dissolved, the oil turning clear; the constant restored after three weeks.
Filtered oil (2 litres) (Stored in a heated room from 50 c to 60 c)	0.2766	9.41	No increase of acid observed after three weeks.
When dry air was sent in	0.1936	3.68	Little change noticed; the constant restored after four weeks.

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As regards the variation in the increase of acid when Oil is kept at a high temperature, the Oil was kept in a drier at 105° C. for different lengths of time, and the free fatty acid was examined and measured, the results being as follow:—

Left for	Free fatty acid		Rate of increase of acid to its inherent acid
	At beginning	At end	
2 hours	0.163	0.166	0.19
„	0.164	0.174	0.59
4 hours	0.140	0.194	3.86
„	0.163	0.102	2.39
„	0.164	0.205	2.5
„	0.140	0.166	1.8
12 hours	0.143	0.286	10.0
„	0 183	0.302	6.7

No constant of increase of acid was obtainable, but the longer the oil under test was allowed to stand, the greater was the increase of the free fatty acid.

It will be noted from the above results of the tests that

(1) When either crude oil or filtered oil is kept from contact with air as far as possible, for instance, in an exsiccator, the rate of increase of acid was not marked.

(2) The rate of increase of acid was comparatively low also when crude or filtered oil was kept in the dark.

(3) The same held true when dry air was sent in.

In the case of (1), the increase of acid was extremely slow, and after nine weeks, the constant was restored.

From this it may be inferred as effective in preventing the deterioration of oil in quality to minimize its contact with air.

In the case of (2), the quantity of acid became constant after five weeks, showing that storage in the dark is more desirable than exposure to the sun.

Again, when oil is kept in a humid atmosphere, whether crude or filtered, the oil will absorb the moisture with more or less avidity, causing the oil to thicken and also raising the rate of increase of acid. It is patent what a deteriorating effect the presence of moisture has on the quality of oil.

As to oil stored at a high temperature, filtered oil shows a smaller rate of increase of acid, compared with crude oil. Still, the rate of increase is unmistakably higher than in other conditions. Such a contrast is all the more striking according

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to the lengths of time kept at a temperature above 100° C. These are phenomena resulting from the dissolution of oil, and it deserves special notice that the process of dissolution goes on more rapidly in water of normal temperature.

STORAGE OF BEANS IN OSIER BINS ON DAIREN WHARVES.

Next, any impurity contained in crude oil, how small it may be in quantity, when it acts catalytically, was considered as a cause of the increase of free fatty acid, and some crude oil with all its impurities and some filtered oil were left untouched for a long time, to determine their respective acid values.

The above mentioned both samples were stored in the dark, and if any precipitation was found to settle, it was shaken well, and then a sample was obtained for examination and measuring.

	Free fatty acid		
	In crude oil	In filtered oil	Rate of acid value
At be ginning	0.2484	0.2000	1.5 : 1
After 4 weeks	0.4703	0.2143	2.2 : 1
After 8 weeks	0.8783	0.2282	3.9 : 1
After 12 weeks	1.1756	0.2351	4.9 : 1

According to the above, oil, when once filtered, compared with crude oil, shows little increase in the free fatty acid. On the contrary, in the case of crude oil,

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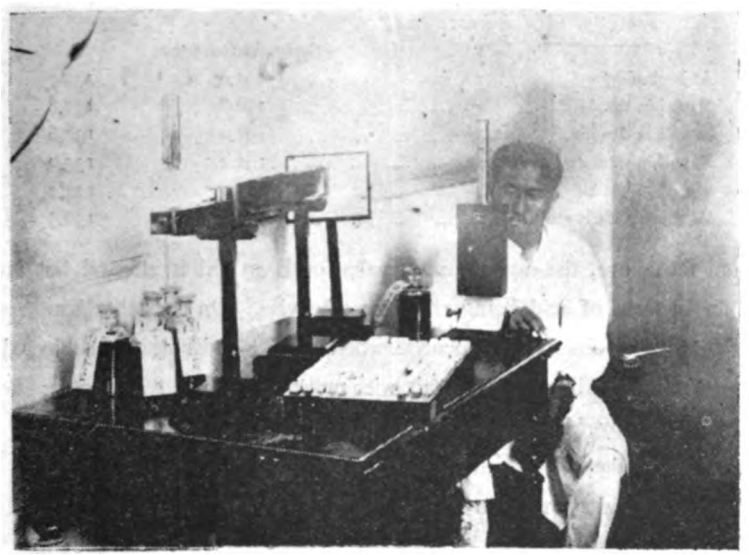
at the end of 12 weeks, the quantity of acid is found to rise to fivefold, perhaps due to a catalytic solution.

For this reason, when Bean Oil is to be stored in a large quantity for a long period, it ought first to be cleared of what impurities are contained by filtering.

Moisture and Bean Oil.

We have learned by experiment that the dry air affects Bean Oil just little, and that the moist atmosphere is prone to cause deterioration in the quality of Bean Oil.

Again, we have brought some Bean Oil on sale on the market into contact with dry air after the oil has been filtered, and also into contact with moist air after letting the air pass through water. These experiments have been conducted



MEASURING OF COLOUR OF BEAN OIL AT GENERAL LABORATORY, DAIREN.

in order to see what effect, if any at all, may have been produced on the saponification value and also iodine value.

It has been found that dry air does not cause any change in the oil, while, on the contrary, moist air increases the acid value, causes the oil to thicken in

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the fourth week, makes it more turbid in the fifth week, causes it to emit an acidifying smell like the odour of bird-lime and increases the settlings from the seventh week, and in the tenth week, the decomposing process goes on so actively as to make it difficult to obtain any two samples of the same quality.

	Moisture	Free fatty acid	Saponification value	Iodine value
Bean Oil...	0.141	0.4426	190.8	134.3
After dry air has been sent in for five weeks	0.141	0.4426	190.2	134.3
After moist air has been sent in for a week	0.3360	.4444	193.4	133.4
After moist air has been sent in for five weeks...	0.345	0.5255	191.4	131.2
After moist air has been sent in for ten weeks...	0.606	0.6274	190.3	132.2

The indices for the samples of Bean Oil subjected to the test are as under:—

	Saponification value	
At beginning	191.0	132.7
Stored in the dark	190.8	132.8
Stored in dry air	191.0	132.6
Stored in saturated moisture	191.2	135.0
Stored in hot air	191.0	133.2
When dry air is sent in	190.7	132.5

From the above, the saponification value of Bean Oil is affected but little in case of an increase of acid being noted or otherwise. On the other hand, on the whole, the value is observed to increase when the oil under test is subjected to a high temperature or is brought to contact with moisture. These results contradict the conclusion drawn by Messrs. Mathes and Dahl who say from experiments that moist air always lowers the iodine value.

This point awaits further investigation.

Receptacles and Bean Oil.

Nothing has yet been said about the effect of the receptacle, in which Bean Oil is packed, on the appearance of the contents.

However, when Bean Oil is kept in a glass vessel, which is liable to generate alkali by solution, the free fatty acid is known to decrease in value when left therein for some time from the original quantity.

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Next, some kinds of receptacles get eroded through the impurities in the oil, threatening at times to deteriorate the quality of the oil.

In our cases, the samples have been obtained from Bean Oil on the local market, packed in oil tins.

BALANCE ROOM, GENERAL LABORATORY, DAIREN.

In order to ascertain whether or not any change will take place in the amount of the free fatty acid, when stored in a glass bottle and also in a tin can, the oil in the two different kinds of receptacles has been left to stand for eleven weeks, but no change has been indicated in the amount of fatty acid, as shown under :—

	In glass bottle (1 litre)	In tin can (about 1 litre)
Free fatty acid at beginning	0.4986	0.4986
After one week	0.4979	0.4979
After five weeks...	0.4978	0.4978
After ten weeks	0.4978	0.4978

Next, 1 litre of ordinary Bean Oil on the market has been put in three different kinds of receptacles (A) a galvanized metallic vessel, (B) a vessel made of iron plate, and (C) a vessel made of tinplate. At the close of each week succeeding, the oil has been examined, giving the following data :—

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	Free fatty acid	Saponification value	Iodine value	Ash	Remarks
At beginning	0.7449	191.9	132.9	0.039	Moisture 0.107; Specific gravity 0.9264
At end of 1st week ...	0 7746	--	—	—	
Vessel A	0.9192	190.9	131.8	0.04	No special metallic reaction shown in ash
Vessel B	0.7606	190.3	132.6	0.035	,,
Vessel C	0.7746	190.3	132 7	0 04	,,
At end of 2nd week...	0.7883	--	—	—	
A	0.6777	190.8	132 3	0.04	,,
B	0.7381	189.6	132.9	0.04	,,
C	0.7883	190 8	131.5	0.04	,,
At end of 3rd week ...	0.8460	—	—	—	
A	0.6912	190.4	132.3	0.045	,,
B	0.7380	190 1	132.0	0.038	,,
C	0 8022	191 8	132.3	0 040	,,
At end of 4th week...	0.8714	—	—	—	
A	0.6569	190.7	132 3	0 048	,, specific gravity, 0.9264
B	0.7469	191 9	132.8	0.94	,, ,,
C	0 8443	191.9	132 1	0.039	,, ,,

In the above tests, the Bean Oil used as standard showed an increase in free fatty acid from 0.7449% at the beginning to 0.8714% at the close of the fourth week.

Next, looking over the samples of Bean Oil kept in the three different kinds —A, B, and C—the contents of A indicated a decrease in free fatty acid; those of B gave a like result; and, as to those of C, no change was observed.

In the case of A (a vessel made of galvanized metal), the surface was noticed to come off gradually as weeks went by, producing a precipitation, chiefly zinc.

This decrease of the acid value, as instanced in the above table, is now under investigation. It is perhaps due to the fact that the free fatty acid has combined with the metal dissolved by electricity and has formed a salt. In fact, the coming off of the zinc seems to bear out such theory. Especially, the change of colour of Bean Oil is more notable, as is denoted under:—

Bean Oil, 2 inches deep, measured by the Robibont tintmeter.

	A (galvanized metal)		B (iron plate)		C (tin plate)	
Standard glass	yellow	red	yellow	red	yellow	red
Bean Oil for test	61.2	7.0	61.2	7.0	61.2	7.0
At end of 1st week	62.2	7.0	81.4	4.6	57.5	6.8
2nd ,, ...	64.1	6.6	110.4	1.3	60.5	6.8
3rd ,, ...	62.2	6.5	118 0	1.6	60.2	6.6
4th ,, ...	62.2	6.5	120.2	1.6	57 8	6 6

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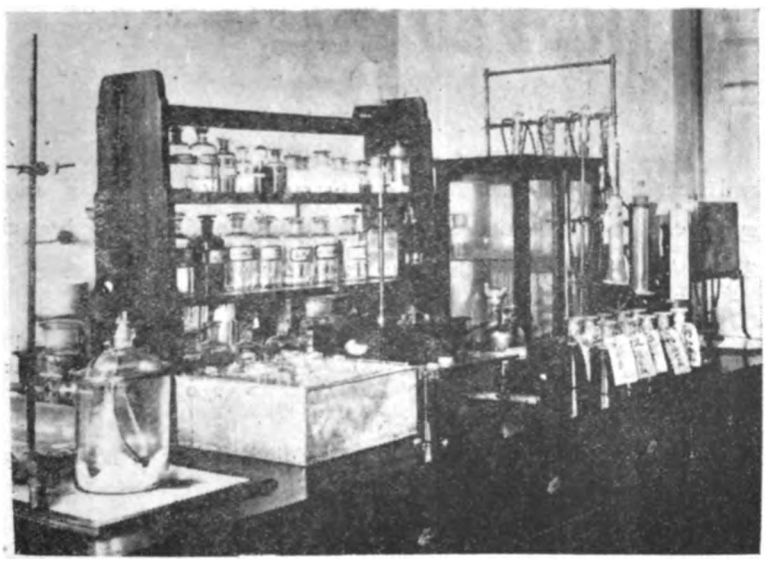
It must be noted that the above data have been obtained as the result of only one experiment, whilst further experiments ought to be conducted to confirm the same.

In the cases of A and C, little change has been observed, a tendency of fading even being noticed. On the other hand, with B, the colour has been found to darken perceptibly.

Precipitations and Bean Oil.

It is well known that the storage of Bean Oil expressed afresh produces a precipitation. In ordinary circumstances, the precipitation is put at 1% of the storage amount.

We left Bean Oil just expressed in a long glass tube. The floating matter was slow to settle, and it took about four weeks for it to get practically precipitated,



GAUGING OF SPECIFIC GRAVITY OF BEAN OIL,
GENERAL LABORATORY, DAIREN.

and, at the close of the fifth week, the oil became a clear liquid of uniform colour. The settlings amounted to 1.26% of the dimensions of the oil, and, if dried, they were found to be 0.09. When the oil is freed from the settlings, no further precipitation is formed unless the oil contains water or other impurities.

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The settlings have been obtained from the Nisshin Oil Mills, Ltd. Dairen (Mr. J. Furusawa, Managing Director) and been subjected to analysis, the results of which being as follow:—

Water	14.05
Ether lixivium...	46.98
Crude albumen	2.75
Other organic matters	32.65
Ash	3.57

In order to neutralize 10 grammes of Bean Oil, 9.96 grammes of caustic potash is required. If this is included in the calculation as olein acid, the oil amounts to 50.18. About half the settlings consists of fatty acid; the other half consists of water, minerals, albumen, and other impurities, which make factors to lower the quality of Bean Oil.

As already stated Bean Oil, when filtered and freed from the settlings, is less liable to get deteriorated than crude oil, and on this account, for the storage of Bean Oil, the removal of these settlings is necessary.

Conclusion.

We may add that the 140 samples of Bean Oil, above tabulated, were obtained from the bean mills as without the mixture of any other substance. However, there were sixteen kinds suspected of the mixture of some blue bean oil.

The results of gauging by the tintmeter are follow:—

	Blue bean oil		Ordinary bean oil	
	Yellow	red	Yellow	red
Maximum	187.5	8.6	55.0 or 91.5	12.0 or 8.8
Minimum	109 0	1.6	23.0	5.75
Average	106.8	4.4	59.18	6.85

The above table will serve as guide to deciding whether or not a sample of Bean Oil is an ordinary kind or blue bean oil.

In the case of an ordinary kind, the yellow seldom rises above 70. What s near 100 may be regarded as an inferior kind and wears a dark colour.

As to the chemical indices, such as denoting:—

Specific gravity	0.9272
Free fatty acid	0.4011
Saponification value	191 04
Iodine value	134.44

may be accepted as ordinary kinds.

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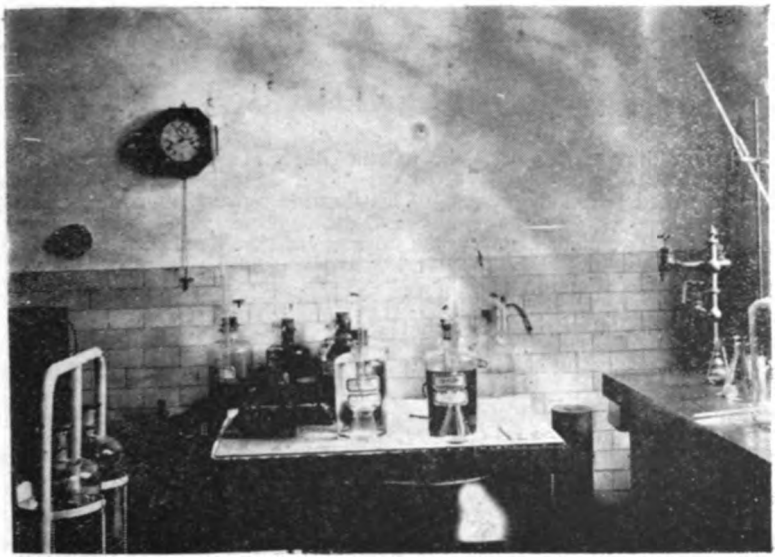
In Bean Oil, the free fatty acid markedly increases to the end of the fifth week after its expression, but thereafter the rate of increase is observed to be very slow except under special circumstances.



GAUGING OF FREE FATTY ACID IN BEAN OIL,
GENERAL LABORATORY, DAIREN.

The chief factors of the increase of the free fatty acid are moisture, a high temperature, and precipitates. Bean Oil which has been eliminated of these impurities shows a less marked change.

Speaking of the receptacles, in which Bean Oil is to be packed, some of them will cause more or less discolouration. An iron vessel, which is rusty, is the worst and should be carefully avoided.

When Bean Oil is to be stored in a large quantity, care should be given what kinds of vessels they are to be kept in. Next, the removal of all impurities and water is the most important.

In conclusion, we are pursuing our experimental study of Bean Oil and also how to decolourize blue bean oil or such as has some of it mixed, and also how to reduce the acid value of such as has an excess amount of free fatty acid, and we may have an opportunity to publish the results of our further investigations.

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BRINGING UP OF NEW BREEDS OF SOYA BEANS IN MANCHURIA.

By Agricultural Experimental Station,
Kungchuling, South Manchuria Railway Company.

1) Introduction.

It is now thirty-eight years since Johann Gregor Mendel (the father of the Law of Heredity) died. Still the system of his doctrine remains immortal, and on the dawning of the Twentieth Century, the advance of the Mendelism has made itself conspicuous in the scientific world.

The fundamental principles of the Law of Biological Heredity have had their scope of study enlarged by the scientists, and their application to the botanical world has worked out a revolution in agriculture. In consequence, the crops of all varieties grown in the world have been gradually improved by a systematic breeding based on science. In some cases, they have succeeded in raising new superior breeds, thereby furthering practical good. By applying the same principles to live stock, improvement can be introduced to any particular part desired, and now a cry has been set up even to improve human race, and this has assumed the form of eugenics.

From early times, wild animals and plants have been domesticated and raised, their breeds being improved by experience and selection.

However, want of knowledge concerning the heredity of biological form often led enthusiastic agriculturists to disappointment, and made faithful breeders cry in despair about the impenetrability of the mystery.

Since the Law of Heredity by Mendel was formulated, facts and circumstances governing heredity have gradually been generalized and systematically arranged. Then, the doctrine of accidental variation was preached by de Fries, followed by Johansen's Pure Breed Doctrine. Thus, long strides have been taken in the progress of the Law of Heredity, and a systematic improvement of agricultural crops has come to take up the most important place in the agricultural improvements.

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2) Object of Bean Breeding.

A century has not yet passed since Beans (Soya Bean) were cultivated in Manchuria for the first time. At first, Soya Bean was grown only to meet the need of making Bean Oil for household use.

Subsequently, with the advance of chemical and manufacturing industry, uses for oil steadily increased. After the Sino-Japanese War, Bean Cake, being the residue left after the expression of Bean Oil, began to be exported from Manchuria to Japan, and the demand for Beans, Bean Oil, and Bean Cake rose by leaps and by bounds. This naturally caused a more extensive cultivation of Beans, and their outputs have been increasing year by year. Now they amount to 18,000,000 *koku* (1 *koku* being equivalent to 4.96 bushels), or half the aggregate product of the world. Beans are now an article of world wide commodity.

IMPROVED BREED OF

No. 2213 No. 738 No. 1103

Such being the case, the economic circle of Manchuria in general is particularly controlled by the harvest conditions of Soya Bean, and to strive for further improvement of its breeds and expansion of its cultivation is a matter having a remarkable bearing upon the interests of not only the agricultural, but also commercial and industrial Manchuria.

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Looking over the kinds of Beans now dealt in on the markets in Manchuria, grains of different sizes and kinds are found mixed. For instance, some are black-eyed; others are of brown-eyed; and there are also white-eyed ones, giving at the first glance an impression of their being a mixture of different varieties.

Again, as to the colour of grains, there are yellow, blue, and black kinds. Next, in shape, too, some are spherical, others elliptical, and a third kind is of an oblate shape. Next, in lustre, there are shades of variation.

From a technical point of view, in a handful of beans obtained at random, there may be found several kinds mixed together.

These are not all. Earth, dirt, grass seeds, etc, are also often found mixed.

It would be too much to expect to maintain with beans of such a quality the good reputation of Soya Bean as a world-wide commodity.

Luckily, in Manchuria and Mongolia, there is left an ample area of waste land of fertile soil, which awaits reclamation and may be utilized for growing Beans.

Therefore, the aggregate outputs of Beans in Manchuria permit of a steady increase, and it is important that they should be bettered in quality, so as to uphold their excellent repute and to exploit their markets in Europe and America with steady success.

The increase of outputs and the improvement of quality may be effected by the extension of the area of cultivation, the betterment of the methods of cultivation, how to apply manure, and how to purify the crops harvested.

However, these same objects may be attained more easily and quickly by the improvement of the breeds of Beans.

From this consideration, we have taken up the work of improving the breeds of Beans, towards realizing a larger harvest on the same space of land and working for the unification of the quality of Beans. Thus, what by the increase of the land for cultivation and by improvement of the methods of growing Beans and of applying manure, the yields of Beans are hoped to be increased, their reputation may be enhanced, and their economic asset may be raised.

Such is our motive in planning the breeding of new superior kinds of Beans at the Agricultural Experimental Station, Kungchuling.

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3) How to Breed Beans.

The principal varieties of Beans cultivated in Manchuria may be roughly classified into the three kinds of yellow, blue, and black beans.

Of these three kinds, the one that is raised most extensively and is produced in greatest abundance is the yellow variety. The blue kind comes next, and the black variety is in a nominal quantity.

The variety possesed of the highest commercial value is also the yellow bean, which is divided into hundreds of kinds, and even of those of one and the same kind, there are still some varieties.

In experimenting on the cultivation of Beans at the Experimental Station, each kind of Beans grown popularly about Kaiyuan and Changchun, the two greatest Bean centres along the South Manchuria Railway Lines, was procured, and by means of selection, a superior breed was obtained. What were got from about Kaiyuan are meant for the varieties for propagation in the Central District and those from about Changchun for those for propagation in the Northern District.

In 1915, the experimental growing on the pure breed selection system was conducted for the first time.

The object of this experiment, together with other data concerning the same, are as under :—

1. Object :
   a. Increase of harvest ;
   b. Increase of oil percentage in Beans.
2. Cultivation :
   a. No manure applied.
   b. Space between any two drills, 2 ft.
   c. Space between any two plants in the same drill, 6 inches.
   d. Two seeds laid down at each point
   e. On germination, about the time the cotyledon has unfolded itself, a thinning operation is conducted, and one plant is made to stand at one point.
   f. Weeding, husbanding, and covering with soil, three times each.
   g. When the beans get ripe, the plants are rooted up, the beans are threshed out, dried, and stored away.

From Kaiyuan and Changchun each, 4,400 Bean plants (totalling 8,800 Bean plants) were obtained which had been grown in conformity to the above mentioned conditions of cultivation, and 700 from Changchun, in addition to 500 from Kaiyuan, were selected as the result of the first experimental year.

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In the second year, the seeds obtained from the same plant were sown at a separate section, and at the close of the season, thirty best breeds each from Changchun and Kaiyuan were carefully selected and were used for the experimental growing of the succeeding year.

In the third and fourth years, the aboveprocess of selection was repeated, and the respective merits of Bean of each variety were carefully measured, and three kinds from Changchun and eleven others from Kaiyuan were chosen as containing the highest oil percentage and yielding the richest harvest, to be used as seeds for the following year.

In the fifth year, a comparative study of harvests was made regarding fourteen finest kinds selected from the results of the two preceding years.

This experiment was repeated in the sixth year, and from the results of the fifth and sixth years, three superior varieties were picked out, and this brought the first stage of improving the breeds of Beans to a close.

Hereafter, the fine breeds of Beans thus obtained are to be propagated as widely as possible, to accomplish the object of this undertaking.

4) Investigations made in First Year.

The following are the results of the comparative study of 4,400 plants each of Kaiyuan and Changchun origins:—

	Changchun origin		Kaiyuan origin	
Colour of blossoms	Total number of plants	Numbers selected	Total number of plants	Numbers selected
White	3,641	330	4,391	484
Purple	705	364	20	16
Length of stem				
Under 1. 2 ft.	13	1	—	—
1.2—1.4 ft.	58	2	4	—
1.4—1.6 "	267	7	—	—
1.6—1.8 "	966	43	5	—
1.8—2.0 "	1,345	114	33	7
2.0—2.2 "	748	169	294	51
2.2—2.4 "	428	201	1,225	132
2.4—2.6 "	182	124	1,620	142
2.6—2.8 "	43	29	785	71
2.8—3.0 "	13	7	182	38
3.0—3.2 "	4	3	78	33
3.2—3.4 "	—	—	54	19
3.4—3.6 "	—	—	17	6
3.6—3.8 "	—	—	3	1
3.8—4.0 "	—	—	2	—

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	Changchun origin		Kaiyuan origin	
Total weight	Total number of plants	Numbers selected	Total number of plants	Numbers selected
Under 2 monme	2	—	—	—
2— 4 monme	80	1	12	2
4— 6 »	650	4	134	14
6— 8 »	1,510	30	593	49
8—10 »	1,142	161	1,432	105
10—12 »	457	290	1,428	156
12—14 »	160	148	561	120
14—16 »	46	46	109	42
16—18 »	17	17	26	2
18—20 »	3	3	6	1
20—22 »	—	—	1	—
Weight of stems				
Under 1 monme	115	1	10	1
1—2 »	2,125	53	448	25
2—3 »	1,406	328	2,080	105
3—4 »	320	226	1,437	208
4—5 »	90	81	237	106
5—6 »	10	10	66	37
6—7 »	1	1	19	16
7—8 »	—	—	2	1
8—9 »	—	—	3	1
Weight of grains				
Under 1 monme	3	—	—	—
1—2 »	167	2	78	20
2—3 »	1,019	9	589	43
3—4 »	1,736	57	1,594	115
4—5 »	747	288	1,269	121
5—6 »	309	259	660	145
6—7 »	65	63	100	49
7—8 »	20	19	11	7
over 8 »	2	2	1	—
Total number of pods				
Under 20	34	—	42	2
20 — 30	314	—	270	10
30 — 40	1,025	1	854	39
40 — 50	1,209	11	1,490	80
50 — 60	742	76	1,172	133
60 — 70	300	176	361	138
70 — 80	186	179	68	53
80 — 90	122	122	27	27
90 —100	63	63	15	15
100—110	38	38	1	1
110—120	20	20	2	2
120—130	8	8	—	—
130—140	2	2	—	—
140—150	4	4	—	—

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Colour of grain	Changchun origin: Total number of plants	Changchun origin: Numbers selected	Kaiyuan origin: Total number of plants	Kaiyuan origin: Numbers selected
Yellow	3,475	392	4,211	459
Bluish yellow	486	249	9	8
Deep yellow	51	24	3	3
Light blue	51	33	22	22
Blue	1	—	1	1
Light yellow	—	—	7	7
Light black	3	2	—	—
Shape of grain				
Sphere	2,861	164	178	98
Ellipsoid	1,191	525	4,068	395
Cylindroid	15	11	7	7
Lustre				
Lustrous	465	192	4,209	459
Lustreless	3,601	508	44	41
Colour of eye				
Light brown	2,267	147	349	66
Brown	309	181	8	8
Tea-colour	874	148	3,877	407
Light black	87	36	3	3
Black	26	13	3	3
White	504	175	13	13

Remarks: 120 momme make 1 lb.

In selecting the Bean breeds, such as have the highest number of pods have been given precedence, and especially such breeds as bear pods that contain two or three grains each, have been chosen first of all. Besides, such as give the hearviest amounts of grain in a single plant have been selected.

5) In the Second Year.

In the second year, the selected breeds, which were considered superior in appearance and quality from the results of the investigations of the preceding (the first) year, numbering 780 of Changchun origin and 500 of Kaiyuan origin, were grown at the experimental farms belonging to the Agricultural Experimental Station, each breed separately by itself.

The individual groups generated by the abovementioned method each came out of the same parent stock, and logically speaking, the hereditary relations between

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the parent-and offspring-plants must be the same, and in case of there appearing a material dissimilarity in either form or quality, it may be concluded that either the parent plant has had its purity adulterated by a cross-breeding, or else the dissimilarity has been caused by accident. At all events, all such stocks should be eliminated, or else they may be available as objects of other experiments.

It will be premature and too often erroneous to judge a parent-plant by its individual form and quality. All plants cannot be reared amidst the same circumstances or envirous, and this difference will give birth to variations. So if the knowledge of the peculiarities of a parent-plant is sought, the individual properties of as many offspring plants as possible should be studied, and their mean must be found out. The mean properties thus obtained indicate at least an approach to the characteristics of that particular stock, and the larger is the number of the offspring plants so studied, the closer will the approach to the characteristics of the parent-plant be.

IMPROVED BREED OF
No. 1103.

In the case of Beans, however, there is a limit to the seed Beans obtainable from any individual plant. So from thirty to seventy specimens have been obtained from one and the same stock, to be subjected to the abovementioned study so as to formulate the mean properties.

Therefore, these mean properties can hardly be claimed as theoretically precise data, but they may be held as denoting the characteristics of the particular stock, to which the plant in question

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belongs, more than those of that particular plant itself. In other words the same mean properties may be accepted as the characteristics of the stock, and thus a comparative study of one stock and another may be conducted, and from among the different stocks, such as possess the characteristics answering the purpose best may be selected for the next year's experiments. This investigation is called the study of hereditary characteristics.

As the result of such comparative study, thirty stocks each of Changchun and Kaiyuan origins have been selected. In making this selection, the data tabulated under have been taken into consideration, in addition to following the principles that guided the selection in the first year.

	Changchun origin		Kaiyuan origin	
Blossoming time	Total number of stocks	Selected stocks	Total number of stocks	Selected stocks
July 20	—	—	1	—
21	1	—	—	—
22	118	4	6	—
23	53	7	19	—
24	260	10	180	11
25	68	4	67	3
26	71	2	53	2
27	88	2	64	4
28	19	—	55	4
29	7	—	18	2
30	9	1	11	1
31	—	—	10	1
Aug. 1	—	—	3	—
2	—	—	2	—
3	—	—	6	1
4	—	—	—	—
5	—	—	2	1
6	—	—	3	—
Colour of blossoms				
Purple	362	16	477	25
White	332	14	23	5
Number of days taken for ripening				
132	5	—	—	—
134	23	—	—	—
136	47	3	—	—
138	103	3	8	2
140	116	3	11	2
142	152	7	45	6
144	132	5	90	4
146	94	7	139	8
148	17	2	138	6
150	3	—	33	2
152	—	—	13	—

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Weight of grains	Changchun origin: Total number of stocks	Changchun origin: Selected stocks	Kaiyuan origin: Total number of stocks	Kaiyuan origin: Selected stocks
Under 7 momme	5	—	35	—
7— 8 "	37	—	54	1
8— 9 "	104	—	93	2
9—10 "	149	—	143	3
10—11 "	117	2	84	6
11—12 "	86	—	46	8
12—13 "	45	11	15	6
13—14 "	21	12	6	3
14—15 "	7	5	—	1
Total number of pods				
Under 80	30	—	142	2
80— 90	92	—	172	1
90—100	112	2	84	4
100—110	114	1	25	1
110—120	82	2	30	9
120—130	52	7	20	8
130—140	52	7	1	1
140—150	21	3	1	1
150—160	12	5	2	2
160—170	1	—	1	1
170—180	3	3	—	—
Weight of 100 grains				
Under 3 momme	5	—	4	1
3—4 "	197	6	81	10
4—5 "	327	16	385	13
5—6 "	42	6	11	6
6—7 "	2	2	—	—
Oil precentage				
Under 17%	1	1	—	—
17—18 "	1	—	1	—
18—19 "	4	2	4	—
19—20 "	32	12	7	2
20—21 "	45	8	23	9
21—22 "	29	5	40	13
22—23 "	3	2	25	2
23—24 "	2	—	3	—

Remark: 120 momme make 1 lb.

The principal bases of selection from the data abovementioned are the number of pods borne by one plant and the weight of the grains. In addition, the weight of 100 perfect grains has also been compared, and the oil percentage contained in each variety, too, has formed still another important factor.

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6) The Third and Fourth Years (1917-1918); Second Study of Hereditary Characteristics.

Each stock of the sixty varieties selected by the first study of hereditary characteristics was grown in an area of 15 *tsubo* (1 *tsubo* being 36 sq. ft.), one plant separately by itself. From each stock more than 300 plants have been obtained, and the individual study of each stock and also each plant belonging to the same stock has been carried on.

As the result, such as have given the least yield and are of indifferent quality have been eliminated. Three stocks of Changchun origin and 11 stocks of Kaiyuan origin were picked out for the comparative study of harvests in the succeeding year.

The characteristics of the fourteen stocks are as under:—

Nos. put on from first	1786	3703	4104	738	1103	1900	1941	1960
					July			
Blossoming time	20	20	19	22	20	22	20	21
Colour of blossoms	white	white	white	white	white	white	white	white
Number of days taken for ripening	163	164	163	160	164	158	154	154
					ft.			
Length of stems	3.14	3.39	3.13	2.72	2.51	2.72	2.62	2.87
					momme			
Total weight	11.9	15.3	12.4	11.6	9.3	11.0	9.3	11.5
					momme			
Weight of stem	3.7	4.8	4.1	3.9	2.9	3.6	3.1	3.8
					momme			
Weight of grain	5.3	6.9	5.6	5.2	4.2	4.8	4.0	5.1
Number of pods: one-podded	3.0	4.6	4.5	4.3	1.8	4.1	2.9	3.1
Number of pods: two-podded	31.5	35.5	29.8	19.5	16.3	19.3	14.4	17.0
Number of pods: three-podded	26.7	31.3	26.3	26.7	26.5	26.8	26.0	31.5
Number of pods: four podded	0.3	0.4	0.3	0.2	0.1	0.2	0.2	0.4
Number of pods: Total	61.5	71.8	60.9	50.7	44.7	50.4	43.5	52.0
					momme			
Weight of 100 grains	4.63	4.99	4.73	4.65	4.16	4.67	4.24	4.51
Colour of grain	whitish yellow	whitish yellow	whitish yellow	yellow	greenish yellow	greenish yellow	greenish yellow	greenish yellow
Shape of grain	oblate	oblate	oblate	round	elliptical	round	round	round
Lustre	none	none	none	lustrous	lustrous	lustrous	lustrous	lustrous
Colour of eye	white	white	white	light brown	light brown	light brown	light brown	light brown

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Nos. put on from first	1786	3703	4104	738	1103	1900	1941	1960
				%				
Oil percentage	20.1790	20.717	20.423	21.530	21.832	22.118	21.520	22.062
Place of origin	Chang-chun	Chang-chun	Chang-chun	Kai-yuan	Kai-yuan	Kai-yuan	Kai-yuan	Kai-yuan
Nos. put on from first	2213	3189	3207	3265	3522	3769		
				July				
Blossoming time	24	22	20	21	23	20		
Colour of blossoms	white	white	white	white	white	white		
Number of days taken for ripening	150	154	155	157	152	158		
Length of stems	3 16	2.67	2.92	3.46	2.52	2 74		
Total weight	10.9	11.7	11.3	12.8	8.9	11.5		
Weight of stem	3.3	3.6	3.7	4.5	2.6	3.7		
Weight of grain	5.0	5.2	5.2	5.4	4.2	5.2		
Number of pods: one-podded	2.8	3.2	3.0	5.1	2.3	2.5		
Number of pods: two podded	19.4	19.2	16.5	40.3	15.8	22.5		
Number of pods: three-podded	34.9	29.1	29.4	10.3	24.1	27.1		
Number of pods: four-podded	0.0	0.2	0.3	0.0	0.3	0.2		
Number of pods: Total	57.1	51.7	49.2	55.7	42.5	52.3		
				momme				
Weight of 100 grains	4.06	4.67	4.67	5.50	4.54	4.83		
Colour of grain	whitish yellow	greenish yellow	greenish yellow	whitish yellow	greenish yellow	greenish yellow		
Shape of grain	oblate	round	round	oblate	round	round		
Lustre	none	lustrous	lustrous	none	lustrous	lustrous		
Colour of eye	light brown	light brown	light brown	white	light brown	light brown		
Oil percentage	22 429	20.826	21.179	19.642	21.324	21.209		
Place of origin	Kaiyuan	Kaiyuan	Kaiyuan	Kaiyuan	Kaiyuan	Kaiyuan		

7) Comparative Study of Harvests Fifth and Sixth Years (1919-1920).

Against the fourteen varieties selected by the results of the preceding experiments, four white flowered varieties of Changchun and Kaiyuan origins, which have been more purified by the careful selection of grains have been chosen for a comparative experiment. In addition, in order to find out, if possible, what differences there may be caused by reason of the non-uniformity of the productive power of land, standard sections have been laid out on each side of the experimental farm and also in the middle, thus the total number of sections were 21. Each

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section comprised about 6 *tsubo* and Beans were planted singly at the interval of 0.3 ft. No manure was applied. In 1919, each stock was allowed three sections, and in 1920, four sections each. In this manner, the comparative study of harvests was carried on.

8) Selection of Superior Stocks.

a) Superiority from standpoint of harvests.

For the purpose of comparing the respective merits of the Bean stocks, the averages of the seven sections of each stock grown experimentally during the two years of 1919 and 1920 were obtained. Further, the difference in the productive power of land and other causes affected the harvests more or less, and this fact being borne in mind, the sections that gave the two extremes of superiority and inferiority were taken out of account, and the results were converted to the *tan* unit (1 *tan* being 300 *tsubo*) as follow:—

Mean data of the Five Sections for each Stock.

Nos. put on from first	1786	3703	4104	738	1103	1900	1941
Total weight (kuan)	105.705	105.210	115.245	115.785	112.500	109.485	101.115
Total weight of stems (kuan)	45.990	46.215	52.200	51.300	49.790	47.745	41.895
Total weight of grains (koku)	33.165	35.325	37.665	39.240	39.330	37.710	37.170
Total measure of grains	0.983	1.040	1.103	1.172	1.163	1.123	1.100
In Order: Total weight	9	10	3	2	4	6	12
Weight of stems	10	9	2	3	4	6	16
Weight of grain	16	14	8	2	2	7	9
Measure of grain	16	14	8	2	3	7	9
No. put on from first	1960	2213	3189	3207	3265	3522	
Total weight	98.100	107.370	91.260	82.260	116.910	97.020	
Total weight of stems	40.590	47.070	43.110	38.745	66.240	44.820	
Total weight of grain	34.200	38.430	32.085	29.745	39.780	36.585	
Total measure of grain	1.013	1.139	0.953	0.875	1.186	1.067	
In Order: Total weight	14	8	17	18	1	15	
Weight of stems	17	7	14	18	1	13	
Weight of grain	15	4	17	18	1	11	
Measure of grain	15	4	17	18	1	11	

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Nos. put on from first		3765	Changchun White blossomed	Kaiyuan White blossomed	Original breed	Original breed
Total weight		98.730	90.615	111,285 kuan	108,270	101,835
Total weight of stems		45.675	41.940	48,870 kuan	46.530	45.765
Total weight of grain...		35.955	37.890	38,205 koku	36.945	36.090
Total measure of grain		1.066	1.128	1.130	1.090	1.005
Order	In Total weight.....	13	16	5	7	11
	Weight of stems	12	15	5	8	11
	Weight of grain	13	6	5	10	12
	Measure of grain	12	6	5	10	13

Remarks: 1 *kuan* is equivalent to 8.3 lbs.
1 *koku* is approximately equivalent to 4.96 bushels.

A glance at the above table will show that No. 3265 gave the largest harvest, followed by No. 738, No. 1103, and No. 2213. No. 3265 was the foremost from the standpoint of yield, and compared with the original breed, its yield was more than 10% larger. As to No. 738, No. 1103, and No. 2213, an increment by about 10% in harvest was noted. It is thus plain that No. 3265, No. 738, No. 1102, and No. 2213 are unmistakably superior to their original breed in point of harvest, but what can be their respective oil percentages is compared by the results of analyses as mentioned below.

b) Superiority from standpoint of Oil Percentage.

The grain produced from year to year has been subjected to the ether lixiviation process to measure the quantity of crude oil contained therein, and its percentage to the dried weight of the grain was figured out as the annual average fat percentage as under:—

No. put on from first	1786	3704	4104	738	1103	1900
	%	%	%	%	%	%
1916	20.491	20.703	20.281	21.689	21.301	21.232
1917	19.055	20.547	21.941	21.019	21.354	21.914
1918	20.179	20.717	20.423	21 530	21.832	22.118

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No. pnt on from first	1786	3704	4104	738	1103	1900
	%	%	%	%	%	%
1919 A	19.757	20.846	20.342	22.842	22.525	22.305
1919 B	19.446	20.555	19.820	21.081	20.988	21.240
1919 C	19.783	19.785	21.722	21.452	21.263	21.100
General average	19.785	20.526	20.755	21.602	21.544	21.652
Average obtained by eliminating highest & lowest Sections ...	19.791	20.631	20.692	21.438	21.438	21.626

No. put on from first	1941	1960	2213	3189	3207	3265
	%	%	%	%	%	%
1916	21.900	22.375	21.795	22.043	20.920	19.862
1917	21.515	21.662	21.337	21.711	20.784	19.660
1918	21.520	22.062	22.429	20.826	21.179	19.642
1919 A	22.746	22.733	22.719	22.579	19.113	19.929
1919 B	20.891	20.992	20.996	21.028	20.936	19.763
1919 C	21.304	21.141	21.146	21.040	21.550	20.086
General average... ...	21.646	21.828	21.732	21.538	20.747	19.824
Average obtained by eliminating highest & lowest Sections ...	21.560	21.810	21.677	21.456	20.955	19.804

No. put on from first	3522	3769	Changchun white blossomed	Kaiyuan whiie blossomed	Original breed	Original breed
	%	%	%	%	%	%
1916	21.938	21.534	—	—	—	—
1917	21.254	20.055	20.374	21.281	20.405	21.429
1918	21.324	21.299	19.857	20.322	19.988	20.614
1919 A	21.335	20.898	20.634	21.236	19.561	21.148
1919 B	20.936	21.616	19.644	20.989	19.534	20.902
1919 C	21.288	22.416	18.938	21.081	19.411	21.066
General average... ...	21.346	21.303	19.889	20.882	19.780	21.032
Average obtained by eliminating highest & lowest Sections ...	21.300	21.337	19 958	21.102	19.694	21.036

According to the above table, the stock that contains the largest quantity of crude fat was No. 1960, No. 2213, No. 1900, and No. 1941 also being shown to contain about 10% more than the original breed. At the same time, it is shown that No. 738, etc., which proved superior in point of yield, contain a considerably larger percentage of crude fat.

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c) Superiority from Dual Standpoint of harvest and fat.

We admit that the fundamental object of our breeding experiments is to select such stocks as give the largest yield and the highest oil percentage. However, the results of these experiments have shown that those superior in point of harvests are not always superior also in point of fat percentage. Of the superior varieties, what may be recommended as comparatively superior in both these assets is No. 2213. Next come No. 738 and No. 1103. All these indicate an increase by about 10% in harvest and oil percentage. Besides, the grains are of uniform size and of excellent quality, the purity of the stock being admirably preserved.

IMPROVED BREED OF No. 738.

d) Characteristics of Superior Breeds.

(1) Improved stock of No. 2213. The stem stands from 2.5 ft. to 3 ft. The blossoms are of white colour; the pods are of light yellow, generally with white hair. The grain is of the shape of ellipsoid and of whitish yellow. It is lustreless, the eye, which is thin, assuming somewhat a brownish tint. This stock gets ripe neither early nor late. About Kungchuling it ripens about the latter part of September, and may be grown in any region from about Fengtien (Mukden) north to Changchun.

(2) Improved stock of No. 738. The stem stands about 2½ ft.; its blossoms are white; the stems are of light yellow, with light brown hair. The grain is spherical in shape and yellow, having lustre. The eye is small and is of light

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brownish colour. It is a late variety among the medium group. About Kungchuling, it gets ripe between the latter part of September and early October.

(3) Improved stock of No. 1103. The stem is from 2 ft. to 2½ ft. in length; it has white blossoms and deep-black pods with light brownish hair. The grain is greenish-yellow in colour and somewhat elliptical in shape, being lustrous. The eye is small and brown in colour. It belongs to the medium group (in ripening) and ripens about Kungchuling towards the end of September.

9) Conclusion.

The breeding experiments started in 1915 were concluded in the course of six years, and three pure stocks of superior quality were obtained as the result. The propagation of these superior varieties is now to be pushed forward.

These breeding experiments, in their very nature, take a great length of time and a heavy amount of labour to bring them to a satisfactory termination, but the real aim of these experiments is to diffuse superior breeds of Beans. Therefore, whether or not the work of propagation is proceeded with in the right manner is the key to the success of the breeding enterprise. For this reason, the method of propagation should be planned and executed on a systematic basis.

Some interesting hints on this topic may be given under:—

In order to accomplish the propagation of these superior stocks or breeds, a central nursery farm, propagation farms, and distribution farms should be laid out. On the central nursery farm, the breeding seed-beans are to be reared; these seed-beans are to be propagated on an extensive tract of land; and supplies of seed-beans for the distribution farms should be procured. On the distribution farms, the same superior species are to be grown simply for the purpose of distribution of the seed-beans to the farming classes at large.

The central nursery farm may be kept on the premises of the Agricultural Experimental Station, Kungchuling, only. As to the propagation farms, they may be founded at several points under efficient control, and care should be taken not to adulterate the pure stocks with a cross-breed.

When the locality about one of the distribution farms has become supplied with plenty of the improved superior breeds, the farm may be shifted to another

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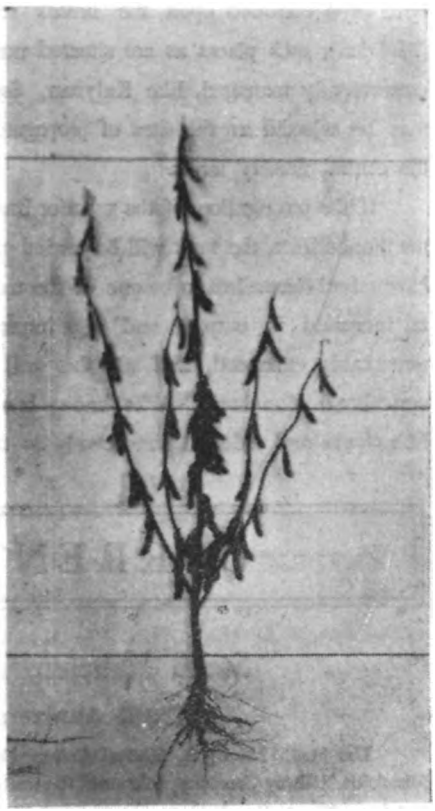
place where it may begin the worthy task. So, a distribution farm is liable to be shifted from one place to another. These distribution farms may be maintained either under direct management of the South Manchuria Railway Company, or may be entrusted to some capable farmers of sound reputation, and the seed-beans put out from them may be purchased for distribution.



IMPROVED BREED OF No. 2213.

Next, as to what the sizes of the different farms should be, although the larger their sizes are, the quicker our original object may be realized, still they must be subject to one or another form of limitation.

Supposing that 3,000 *tsubo* may be set aside for the purpose of the central nursery farm, 6 *to* (1 *to* being 1/10 *koku*) of seed-beans may be sown on such farm. Again, supposing that the seed-beans obtainable from this farm be 1.1 *to* per 300 *tsubo*, the total yield from this farm will be 11 *koku*. In order to make use of all those seed-beans, 54,000 *tsubo* of land will be wanted for the propagation farms, which will yield about 198 *koku* of beans. The distribution farms that will dispose of all these outputs must be as large as 990,000 *tsubo* in all, which is expected to put out 3,630 *koku*, the amount to be distributed to the farmers annually.

By the above means, not only 3,630 *koku* of seed-beans is obtainable, but again, by reason of the mobility of the distribution farms, the propagation work may be executed with greater ease and despatch than generally expected. Especially, if the co-operation of the Chinese authorities can be enlisted upon some happy understanding being concluded, a surer success will be attained.

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As to the locations for the propagation farms, the principal bean producing centres will of course be desirable, but since the improved breeds already mentioned have been obtained upon the breeds native in the regions north of Fengtien (Mukden), such places as are situated north of Fengtien (Mukden) and as may be conveniently managed, like Kaiyuan, Ssupingkai, Kungchuling, and Changchun may be selected as the sites of propagation farms to be kept in good touch with the central nursery farms.

If the propagation of the superior bean breeds be proceeded with on the above mentioned lines, the work will be carried on very smoothly, and the Soya Beans that have raised themselves to be one of the most important world-wide commodities will be increased in outputs and also improved in quality. Their reputation will be remarkably enhanced, and all this will open a new epoch in the annals of the agricultural Manchuria. Who knows but this will not enliven afresh the industrial Manchuria and redound handsomely to the proft; of both China and Japan.

CURRENT NEWS.

South Manchuria Medical College.

Tenth Anniversary celebrated.

The South Manchuria Medical College Fengtien (Mukden) under management of the South Manchuria Railway Company, celebrated the tenth anniversary of its establishment on the morning of October 11th, 1921. Military Commanders Sun and Wu, of Kirin and Heilungkiang Provinces, respectively, Director Hsieh of the Board of Education, Foreign Intercourse Officer Tung, Police Director Wang, etc., were among the most prominent Chinese present. Consul-Gen. Akatsuka, etc., also attended, together with Dr. T. Araki (President, the Imperial University, Kyoto), the middle school Principals from Japan, who had taken part in the national conference at Mukden.

Mr. K. Nakagawa, (Managing Director, the S. M. R. Co. Local Administration Department) on behalf of President Hayakawa of the Railway Company, awarded prizes to Dr. I. Inaba (Director of the College), and a number of Professors, officials, etc., who had served the College since the very beginning.

The most conspicuous amongst the guests on the occasion was Mr. Geo. E. Vincent (President, the Rockefeller's Foundation, Peking) and Dr. Wu-lienteh, the noted Chinese bacteriologist was also there. Each delivered a congratulatory address.

On the above occasion, the history of the College for the ten years since the establishment of the College was compiled in Japanese and distributed.

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Dr. Inaba (Director) in the preface, says as follows:—

Ten years have elapsed since the establishment of the South Manchuria Medical College. It affords me high pleasure to trace back the history of this College filled with the evidences of the earnest guidance of a number of influential personages of Japan and China, and also of the effort of the faculty and management of the College, to the common end of fulfilling its mission.

In the course of these ten years, the world has undergone a complete transformation in both its ethical and materialistic phases. Then, the relations between Japan and China, too, have become drawn more closely together and more complex in the mean time. Again, the medical science and art have been wonderfully developed in theory and application.

In this age of constant progress, we may honestly own that this College has only laid the foundation stone of its ideal and started the work to justify its existence. By the side of the other more brilliant and extensive institutions of the kindred class, this fruit of our humble effort must appear commonplace.

Still, personally, I am of the opinion that this College ought to aim at raising itself to the dignity of one of the first seat of learning in the Orient. At the same time, towards China and her people, this College should undertake to extend the benefit of the latest scientific knowledge and skill in dealing with public hygiene as well as the ailings to which the flesh is heir.

Carrying out the above mentioned enterprises will be to perform our mission and to lay the foundation of the Sino-Japanese amity.

When we think of the enormity of our mission, looking back at what we have been able to do these ten years, we cannot help feeling what a deal is expected of us and what amount of further endeavour must be laid out by us.

In pledging our continued industry, we will look to the public at large for their kind support for us towards the accomplishment of our object.

Below we may cite a brief of the history of the College:—

REVIEW OF WORK.

The dissemination of medical science and skill in Manchuria is held as an integral part of the mission of the South Manchuria Railway Company. To disseminate medical science and skill must be begun with the education and training

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of competent physicians. The South Manchuria Railway Company thought of a medical institute in South Manchuria at its inceptive stage. A few years had to be put in for the necessary preparations, and in 1911, the Viceroy of Manchuria having his headquarters at Mukden was approached, and his support was enlisted. Then the plans were put in execution for establishing the medical college.

The aim of this College is dual:—firstly to turn out good doctors of fine character who, will be capable of contributing to the advance of the medical relief and public hygiene of the Chinese Republic, and secondly to prosecute the study of medical sceence to keep abreast with the Western Elders and to elevate this College to a place of high repute among its kinds in China.

1) Standard of College.

The standard of this institution has been set in line with a college. Still, attention has been concentrated to the perfection of both curriculum and equipments. The management aspires to a place of honour among the medical institutions of China.

Further, in response to the requirements of the marching time, the Railway Company has under contemplation the plan to get the College raised to the same plane as a full-fledged College of the Imperial University of Japan.

2) Location.

When this College was brought into being, the Railway (New) Town of Fengtien (Mukden) was only sparsely populated and lacked facilities wanted by an institution of its class. There was little prospect of obtaining clinical material. However, the cardinal principle of the Sino-Japanese co-existence and co-prosperity and the central location of Mukden, both politically and geographically, in Manchuria prevailed, and the Company's choice was fixed upon the present site.

3) Students.

As to students, both Japanese and Chinese are admitted, so that the mixed study in the same class rooms may draw them nearer, and this may pave the way to future co-operation and fellowship, professionally as well as socially.

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4) Spirit of Education.

The spirit of education lies in equipping the students with the general elements of medical science and also inculcating self dependence on them.

In class work, theory is complemented with practice, and original investigation and research is encouraged.

A Dormitory is maintained, requiring all the students to live therein. It is to make them learn how to look after themselves in daily life and also to emulate a habit of industry among the students.

5) Curriculum.

As to the curriculum, the College stands on the same level as a Medical College in Japan. Only the Chinese students have to learn Japanese, and the Japanese students Chinese. This point of dissimilarity is worth noting. By the linguistic bridge, the young students of the different nationalities are brought to mutual contact personally and spiritually.

6) Graduates.

So far most of the graduates of the College are employed either at the alma mater or at the hospitals along the South Manchuria Railway lines. As an understanding is established with the Chinese authorities concerned and the graduates increase in number, the graduates are intended to be sent to different parts of China, to render services to the Chinese authorities in looking after the public hygiene, and to minister to the needs of the inhabitants in the remotest districts.

7) Railway Hospital.

In the Railway Hospital attached to the College, the students are offered opportunities to treat patients under directions of their seniors, besides receiving lessons in clinical study. The students are given practical training and are to be impressed with the profession of medicine and hygiene transcending the geographical boundaries.

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8) Results of Investigations.

The College, in addition to the training of physicians and the treatment of the patients, assumes the task of carrying on the medical study with a view to contributing to the general advance of the science. Many members of the faculty have published the results of their investigations and researches through the columns of domestic and foreign journals. These articles are, at the same time, compiled into books under the title of "Essays by the Faculty of the South Manchuria Medical College," for distribution to the medical institutes of the world. So far such articles number altogether 180, and four of the abovementioned books have appeared in print and been distributed.

9) Primary Object of the College.

Thus, the College, while turning out competent physicians for its chief work, serves at the same time as a medical institute and also a medical relief medium. Furthermore, it works constantly for the betterment of the public hygiene, so as to bear a part in the promotion of the welfare of mankind. Over and above, the College is intended as an effective medium for bringing the Japanese and the Chinese closer.

From the beginning, the Governor of Fengtien Province has been nominated Honorary President of the College, and an official of the Fengtien Government been asked to serve as Honorary Secretary.

In short, the primary object of founding the College consists in laying the foundation of Sino-Japanese co-existence and co-prosperity.

HISTORY.

1911.

On June 15, Dr. K. Kasai, Igaku-hakushi (Superintendent-General of the Railway Hospital, Dairen), was concurrently appointed Director of the College. The College was opened on the premises of the Railway Hospital, Mukden, and H. E. Chao-erhsun (Viceroy of Manchuria) was nominated Honorary President of the College.

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On August 24, an application was filed with the Governor-General of Kwantung for the establishment of the South Manchuria Medical College in terms of Article 4 of the College Act. The desired permission was granted on September 8.

On October 10, 20 Japanese and 8 Chinese were admitted to the Principal Course and the Preparatory Course respectively.

On November 12, the opening exercises of the College were held.

1912.

On February 15, the recognition of the College in terms of Art. 13 of the Military Conscription Act was proclaimed by Notice No. 33 of the Department of Education.

On September 20, 20 Japanese were admitted to the Principal Course, and 20 Chinese to the Preparatory Course.

In November, H. E. Chao-erhsun resigned the Honorary Presidency of the College, and Military Governor Chang-hsilan of Fengtien Province was nominated in his stead.

1913.

On September 20, 20 Japanese and 5 Chinese, who had completed the Preparatory Course, were admitted to the Principal Course; 36 Chinese, including 22 students sent by the Provincial Government of Fengtien, were admitted to the Preparatory Course.

1914.

On June 18, by Notice 111 of the Department of Education, the graduates of the College were qualified to set themselves up in medical practice.

On September 20, 20 Japanese and 14 Chinese were admitted to the Principal Course, in addition to 36 Chinese, including 6 sent by the Kirin Provincial Government, being admitted to the Preparatory Course.

On November 19, Dr. K. Kasai was relieved of the Directorship of the College, and Dr. M. Yamada succeeded him.

On June 1, the Railway Hospital, Mukden, was attached to the College.

On September 1, the first batch of ten graduates was turned out.

On September 4, owing to the transfer of Mil.-Gov. Chang-hsilan (Honorary President), Gen. Tuan-chihkuei, his successor, filled the vacancy.

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On September 12, 27 Japanese and 21 Chinese, in addition to 2 Japanese special students, were admitted to the Principal Course, and 32 Chinese to the Preparatory Course.

On October 10, the first graduation exercises were held, simultaneously with the celebration of the completion of the new College building.

On October 31, the first batch of 15 apprentice nurses attached to the Railway Hospital completed their course.

1916.

On April 1, 23 Japanese and 21 Chinese were admitted to the Principal Course. On the 14th, 33 Chinese were admitted to the Preparatory Course.

On May 1, 9 Japanese girls were admitted to the Nurse Training School attached to the Railway Hospital.

On July 1, the second batch of 12 graduates were turned out.

On August 14, by Notice No. 134 of the Kwantung Government; the Nurse Training School attached to the Railway Hospital was duly recognized by the Kwantung Government.

On August 22, Dr. S. Yamanoi was appointed to act for Director of the College during the absence of Dr. M. Yamada ordered abroad.

On October 14, Gen. Tuan-chihkuei having resigned Honorary Presidency, H. E. Chang-tsolin (Military Commander and Governor of Fengtien) was nominated his successor.

On April 1, the Preparatory Course of the College was detached from the College, and attached to the South Manchuria Middle School founded at Mukden for Chinese boys.

On the same day, 29 Japanese and 19 Chinese were admitted to the Principal Course.

On July 2, the third graduation exercises for 20 graduates were performed.

1918.

On April 1, 24 Japanese and 20 Chinese were admitted to the Principal Course.

On July 25, a dormitory for the nurses was completed.

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On July 7, the fourth batch of graduates, comprising 21 Japanese and 11 Chinese, was turned out, and the graduation exercises were held.

On December 6, Dr. M. Yamada (Director) returned from his tour abroad, and Dr. Yamanoi was released of the Acting Directorship.

1919.

On April 1, 23 Japanese and 24 Chinese were admitted to the Principal Course.

On July 6, the fifth graduation exercises for 24 Japanese and 10 Chinese were held.

On November 1, a ward for the weak minded attached to the Railway Hospital was opened.

1920.

On April 1, 26 Japanese and 20 Chinese were admitted to the Principal Course.

On June 25, the anniversary day of the establishment of the College was changed to October 12.

On July 8, the sixth batch of 25 Japanese and 14 Chinese graduated.

On August 11, Dr. M. Yamada (the Director) was released of his post at his own request, and Dr. J. Inaba was appointed Director of the College and Superindent General of the Railway Hospital.

1921.

On April 2, 32 Japanese and 16 Chinese were admitted to the Principal Course.

On June 23, the seventh batch of graduates consisting of 17 Japanese and 11 Chinese was turned out.

SUPPLEMENTARY.

History of Railway Hospital, Mukden.

Prior to being attached to Medical College.

April 1, 1907. On the establishment of the South Manchuria Railway Company, the buildings and contents belonging to the Mukden hospital of the Field Railway Department at the west of the railway track in the Railway Town of Mukden were taken over to be used as the Mukden branch hospital of the

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Dairen Railway Hospital. The Interclinique and Surgery Divisions were maintained.

October 23, 1908. A site was selected in the Railway Town, and the construction of the new hospital building was commenced.

June, 1909. The Dentistry Division was added, followed in September with the Gynecological Division.

June 26, 1912. The Ophthalmological Division was created.

August 1, 1921. The branch hospital blossomed out into a full-fledged one consisting of Interclinique, Surgical, Ophthalmological, Gynecological, and Dentistry Divisions.

October 24, 1913. The Rhyno-Laryngo-Otological and Dermatological Divisions were created.

January 18, 1915. The Kinderclinique Division was created.

June 1, 1915. The Hospital was attached to the Medical College.

Location and Site.

The South Manchuria Medical College is located at about 330 yards east of the Mukden Station of the South Manchuria Railway in the Railway Town. It faces on the Circle and its site is square in shape. The southern half is occupied by the College and the northern half by the Railway Hospital. The premises comprise 51,300 *tsubo*, to which may be added a tract of 9,260 *tsubo* to be included in the site, making the total 60,560 *tsubo*.

Fushun Collieries.

(1) Location: Fushun Collieries are in Fushun Prefecture, Fengtien Province, Manchuria, and is located at about 20 miles east of Fengtien (Mukden). On the other side of the Hun River, Old Fushun is situated.

Their locations are as follow:—

East Longitude ... ... 124.06°
North Latitude ... ... 41.58°
267 ft. above sea level (or mean tide in Dairen Harbour)

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(2) Mining Zone: About 1,820,000 *tsubo*.

From east to west, about ten miles
From north to south, about two and half miles

(3) Coal Formation:

It originated in the Tertiary Period; Coal is bituminous; average thickness is 130 ft., the maximum thickness being 420 ft.; Strike, 90° N. and 110° E., the seam turning in the direction from north to south at the western end; the seam dips northward from 18° to 38°, turning 24° eastward at the western edge.

(4) Analysis of Fushun Coal:

Specific gravity, 1.276; Moisture, 5.717; Volatile matter, 40.635; Coke, 53.648; Ash, 3.890; Sulphur, 0.530; 7,100 calories; Nitrogen contained being 1.6%.

(5) Coal Outputs, excepting Yentai Colliery:

3,158,000 tons, 1920;	2,928,000 tons, 1919;	2,521,000 tons, 1918;
2,311,000 tons, 1917;	2,044,000 tons, 1916;	2,192,000 tons, 1915;
2,149,000 tons, 1914;	2,179,000 tons, 1913;	1,471,000 tons, 1912;
1,324,000 tons, 1911;	899,000 tons, 1910;	693,000 tons, 1909
490,000 tons, 1908;	223,000 tons, 1907.	

(6) History:

Fushun Collieries seem to have been mined for the first time by Koreans about 600 years ago to be employed as fuel for the manufacture of pottery.

In the Chienlung Era, the Chinese Government, Peking, prohibited the mining on the ground of the proximity of the Collieries to the ancestral mausoleums at Yungling (永陵) and Tungling (East Mausoleum, Mukden 東陵).

In the 27th year of Kwanghsu (1906), some Chinese commenced mining under Government permission, but later the mining concession passed into the hands of the Russian Far East Forestry Co., and before work was actually started, the Russo-Japanese War broke out, and the Collieries were occupied by the Japanese Army. Then, the Japanese Field Railway Department took over the operation of the mines and handed them over to the South Manchuria Railway Company in April, 1908.

(7) Mining Work:

When the South Manchuria Railway Company took over the Collieries, there were only the four pits of Chienchinchai, Yangpaipu, Laohutai, and Yentai, yielding only about 300 tons a day. With the excavation of the two new shafts (Oyama

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and Togo), the daily average outputs in 1911 reached 4,000 tons. In the same year, the excavation of two new pits at Wantawu and Kuchengtzu (the latter being an open cut) was commenced; in 1918 two more new pits, that is, Hsintun and Lungfeng were opened, in addition to Open Cut No. 2 at Kuchengtzu.

The total outputs of the eight shafts and pits, together with two open cuts, amount to about 10,000 tons a day or about 3,200,000 tons a year.

In order to meet the steadily rising requirements in the future, a new plan has been drawn up for an open cut on an extensive scale, and from 1920, Open Cut No. 2 at Kuchengtzu has been extended at a rapid pace, in order to connect it with Open Cut No. 1.

Such being the case, the total outputs will be remarkably increased in the course of a few years.

(8) Mining Method:

The Pillar System used to be in vogue, but, in dealing with a coal seam of such great thickness as the Fushun Collieries, the Sand Flushing System has been accepted as the more desirable. The first installation of the Sand Flushing System was made in Yangpaipu Pit in November, 1912, and it was subsequently extended to Oyama, Togo, Laohutai, and Chienchinchai Pits. The three pits at Wantawu, Lungfeng, and Hsintun have been worked from the first by the Sand Flushing Method.

In the southern part of the Mining Zone, the coal seam may be reached at only about 40 ft. deep from the ground, and on this account, the whole of this district is to be worked entirely by open cut.

In the operation of the open cut system, machinery is brought into active play, and the purposes of earth-stripping, excavators are used, and for dealing with the rocks and for mining purposes, electricity and steam shovels are employed.

(9) Sand Flushing Installation:

The sand gathered by excavators, drag lines, and steam shovels, and also by hand is carried to the sand pocket by tram car, and is sent to the points desired by means of iron pipes by the sand-flushing apparatus. The water used for the flushing purpose is pumped out of the Pits and is used again after being allowed to become settled and clear in the settling pond.

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At present, the daily amount of sand used is about 1,500 cubic *tsubo* (1 *tsubo* being 36 square ft.)

(10) Transportation and dressing of Coal:

The main level roads are equipped with endless rope. For the various inclines, electric haulages are installed, and the inclined and vertical shafts, winding engines, driven by electricity or steam, are used.

Coal tubs brought upon the surface run into the revolving tipplers, and their contents are tipped over the Marcus screens and conveyors to be assorted into lump, nut, and dust coal. While being borne on the conveyors, what shale and stone there are are picked and removed by hand.

All coals are loaded into the railway waggons kept in waiting under the screening house.

Ventilation and Pumping: Ventilation is effected by machinery. There are several kinds of fans such as Walker, Rateu, Campbell, Sirocco, and Buffalo systems.

A reservoir is attached to the pumping room in every pit, and the water gathered therein is pumped out by means of electricity pumps.

The monthly average pumping capacity is 45,016,757 cubic feet, inclusive of what has been used for the sand-flushing purposes.

(11) Motor:

For the operation of the elevators for the Shafts and part of the fans, steam power is used, but for the working of the winders inside and outside the Pits, excepting the above mentioned, fans, and pumps, in addition to what is used for the transportation and screening of coal, electricity is used.

The electric engines are of three phase alternate current induction system.

(12) Light:

Inside the Shafts and pits, the offices, winding machine rooms, and the main level roads are lighted by electricity. For the rest, safety lamps only are used.

In the open cuts, a large number of search lights are used.

(13) Machine and Wood-Working Shops:

There are two Machine Shops; the first comprise the finishing, casting, smithy, lathing, and electricity shops; the second is divided into the finishing, casting smithy, and foundry shops. All machinery and appliances are manufactured or repaired.

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At the Wood-Working Shop, the materials and appurtenances belonging to the offices, workshops, official residences, and other buildings and works are manufactured or repaired.

(14) Auxiliary enterprises:

Electric Power House; There are two electric power stations, each having a generating capacity of 19,000 kilowatts. The first uses coal for fuel; whilst the second is equipped with gas producers of the Mond and Lyms systems, provided with the appliances for obtaining bye-products. Gas is used as fuel for generating steam in order to generate electricity.

Again, by extracting the nitrogen contained in the gas, sulphate of ammonia (with the daily capacity for 30 tons) and tar are produced.

The electric power thus generated is supplied for mining, electric tram cars, motor for the public, and electric lighting.

The third power house (producing 12,500 kilowatts) to be worked on the pulverized Coal firing system is in the course of construction.

Sulphate of Ammonia Factory: Sulphuric acid for the manufacture of sulphate of ammonia for use at the Mond Gas Producers Plant and also for supply to elsewhere. Two sets of lead chambers, of the Banky's and Meyers' system, are each capable of turning out 100 tons of sulphuric acid per day with pyrite and blende for materials. In addition, there is a sulphuric acid concentrator to put out strong sulphuric acid.

Coke Ovens: A set of 30 coke ovens (with a daily capacity for about 100 tons of coke) has a coal washing plant attached thereto (capable of washing 30 tons of coal per hour). A tar retort is installed also, capable of disposing of 60 tons of tar per day, and puts out benzoline (for gasolene engines), naphthaline (an insect killer), creosote (as a timber preservative), pitch (for manufacture of briquette), etc.

Waterworks: Water was supplied for the first time in April, 1909. The water source is located on the bank of the Hun River. It is used for the feeding of the locomotive engines and also for drinking purposes. The daily supply capacity is 20,000 cubic metres.

The gas supply was commenced in October, 1909, in the district including the Town of Fushun and the three pits of Oyama, Togo, and Yangpaipu. The daily supply capacity is 90,000 cubic feet.

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Electric trams: Formerly steam locomotives only were used for the sole purpose of transporting coal. As the sand-carrying sidings were constructed with the inauguration of the sand-flushing method, attended with the increase of coal outputs, the steam locomotives were supplanted with electric locomotives, incidentally to facilitate the mutual communications between the different pits, and both passenger and goods traffic was commenced in October, 1914.

The existing railway mileage is as follows:—

Coal carrying lines	38 miles.
Sand gathering lines...	43 „
Open cut lines	26 „

Electric Light: Electric light is served to the official residences of the Collieries staff and the Japanese and Chinese residents. For electric bulbs, tungsten bulbs are used exclusively, 5 candle power lamps being excepted.

Telephone System: The common battery system is used. The subscribers number 860.

Afforestation: Nursery farms have been founded at Kuchengtzu, Togo, Yangpaipu, and Hsintun Pits each, the total area comprising 200,000 *tsubo*. Larch tree, acacia, etc., are raised. The Chinese are, besides, encouraged to take up afforesting work by means of sundry inducements offered.

From 1916 to 1920, altogether 3,162,091 saplings were planted. This number reached 4,000,000 by the spring of 1921.

By the end of the tenth year, the aggregate saplings planted are to number 40,000,000.

(15) Relief Corps, Relief Society, etc.:

Emergency Relief Corps: The Emergency Relief Corps was established in September, 1913. Their members are picked up from among the mining force having some special aptitude. Six men are formed into a Corps, each Pit Office being equipped with from two to five corps.

For rescue apparatus, the Proto and Drager systems are used.

Colliery Hospital: The Colliery Hospital is organized with Interclinique, Surgery, Gynecology, Kinderclinique, Rhino-Laryngo-Otology, Ophthalmology, and Dentistry Divisions. There is besides a separate ward for cases of infectious diseases.

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Each Pit Office has a medical station to administer first aid treatment.

Mutual Relief Society: For the lower class employees, a mutual relief system is maintained to administer relief for the sick and injured and also for the retired servants and the bereaved families of servants.

Fushun Branch of Consumers' Union: In order to supply daily necessaries to the Collieries staff, the Fushun Branch of the Consumers' Union is maintained at the town of Fushun, a sub-branch thereof being kept at each Pit Office.

Amusements and Ethical Culture: There are the Colliery Club, the Fushun Branch of the S. M. R. Co. Athletic Club (including fencing, *jujitsu*, archery, lawn tennis, baseball, and field sports), and the Reading Society.

There are branches of the above at each Pit.

(16) Employees (on March 15, 1921):

	Japanese	Chinese	Total
Officials	736	3	739
Employees...	2,380	2,208	7,588
Regular workmen	87	11,377	11,464
Miners	—	13,335	13,332
Chinese contract coolies ...	—	6,506	6,506
Chinese coolies	—	2,819	2,813
Total	3,203	39,245	42,448

The Collieries Office Management looks after the matters concerning education, hygiene, public works, etc.

The following table may be of some interest:

On April 1, 1921.

Number of School children;

Kindergarden	211
Primary School	1,499
Girl's Practical School	111
Continuation Technical School	284
Apprentice Training School	168
Miners' Overseers Training Institute	27
Chinese Primary School...	51
Elementary Mining School	31

Free Library contains 8,526 books, etc.

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Population (on April 1, 1921.)

	Household	Population
Japanese	5,590	12,870
Chinese	5,870	26,435
Koreans	24	169
Others	3	10
	11,487	39,484

"Present Manchuria and Mongolia."

SERIES III.

Continued from October Number.

History.

Manchuria.

The first reference to Manchuria in history is made about the time of Chitzu. When Emperor Wu of the Chou Dynasty conquered Emperor Chou, the last of the Yin Dynasty, the victor, who founded the Chou Dynasty, made Chitzu, uncle of the vanquished monarch, King of Korea (now Chosen). In the face of conflicting opinions as to the boundaries of Korea, it is inferred that what is now known as South Manchuria was then included in the Korean Kingdom. In the "Reign of Terror" succeeding the fall of the Chou Dynasty, Manchuria was dominated by Yen which named it as Liao. In the Chin Dynasty founded on the ruins of the "Reign of Terror," Liao was divided into Eastern Liao and Western Liao, with the Liao making the boundary line. During the Han Dynasty, a prefectural government was established at Liaoyang. In the latter days of the Second Han, Kungsun established himself in Manchuria which remained under the rule of his family for three generations. Gen. Su-mai, of the Wei Kingdom, laid low the Kungsuns under his master's orders. Then, Manchuria passed under the domination of the Chin Kingdom. In 386-568, Kaokouli rose in the northeast and occupied Manchuria, but was invaded by the Tang emperors. Kaotsung of the Tang Dynasty brought the Kao's rule to an end, and opened a military government. The Chitan Prince then swooped down from the Upper Liao and took Manchuria, dividing it into three principalities and three districts. Then

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the country was named Great Liao. The Chitan was subjugated by the Chin Princes, who were, in their turn, put down by the Yuan conquerors. The Yuan emperors divided Manchuria into seven districts, including Liaoyang, Kuangning, etc. The Yuan Dynasty lasted only a hundred odd years and was supplanted by the Ming Dynasty. The Manchu generals sprang into power at the foot of the Changpai Mountains near the Korean frontier and quickly had Manchuria under their control. It was by them that the name of Manchuria was given. In the Manchu Dynasty, Manchuria was cut up into the three Provinces of Shengking, Kirin, and Heilungkiang, which were called the Three Eastern Provinces. These Provinces were held dear as the cradle of the reigning Dynasty.

It belongs to modern history how Manchuria practically passed into Muscovite hands, and has undergone the changes resulting from the Russo-Japanese War.

As late as the Ming Dynasty, all the territory north of Kaiyuan was inhabited by savage tribes, but now the country has been completely transformed into a land equipped with modern means of communications and also concomitants of civilization.

Mongolia.

What is now called Mongolia used to be referred to in earlier times as the Barbarous Land in China. During the Chinese "Reign of Terror," (722—481 A. D.) the Mongols rose in power and planned an invasion southward. Consequently, the Chin Prince, conjointly with their neighbouring Princes of Yen and Chao, constructed a line of walls along the northern frontier, as a barrier to check the southward advance of the Mongols. As the Chin Prince founded his dynasty on the ruins of the Chou Dynasty, the new Emperor led an army of 300,000 into Mongolia, and further, by extending the existing walls on the frontier, completed what is now styled the Grand Wall.

During the Han Dynasty, the Moguls gained in strength. Emperor Wu vainly tried to drive them out. The Tang Dynasty, too, was frequently raided. As the Yuan Dynasty came into power, Gengis Khan the Great conqueror, became the master of all China, and besides, invaded the Eastern Europe as far west as Hungary. It was the heyday of the Mongolian race.

In the Ming Dynasty, the descendants of Gengis Khan entered Mongolia, but failed to achieve much.

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In the early stages of the Manchu Dynasty, they rebelled, but had to submit because of want of resources.

The Manchu Dynasty propagated Lamaism as a means of enervating the Mongolians, and this policy worked admirably. The Mongolians have lost in spirit and strength, and so chances for their edification have been let slip.

MANCHURIA ENLIGHTENING SOCIETY.

Whose Organ the "Light of Manchuria" is

What actuates us in our endeavours to open up Manchuria and Mongolia lies in realizing our ultimate ideal in the enlightenment and development of Manchuria and Mongolia. It will not do only to develop the natural and industrial resources, but the ethical and intellectual culture of the inhabitants must also be carefully husbanded and nourished, so that both mind and matter may be developed in harmony.

The Manchuria Enlightening Society raised its first cry in order to fill a sorely felt need. Its primary mission is to investigate and propagate the truths of the development of Manchuria and Mongolia. We shall studiously refrain from misleading the public by disseminating inaccurate or exaggerated reports, but shall steadfastly adhere to the truth or facts only.

It is urgently important that the truths regarding Manchuria and Mongolia should be made known clearly not only to Japan and China, but also to Europe and America. On this account, the establishment of the Manchuria Enlightening Society is bound to have a serious significance of international character.

If happily, through the establishment and activity of this Society, the truths of the development of Manchuria and Mongolia should become topics of world wide interest, it would not be only an honour to those now actively engaged in developing these regions, but also a matter of congratulation to the world at large.

We might be permitted to add that the ultimate ideal and desire of this Society are to serve as the herald of all enlightening movements in future, thereby opening a new chapter in the annals of the world's civilization.

What is the Society Like.

a) Office.—The office of the Society is in the Municipal Office Building on Central Circle in the city of Dairen.

b) Society's Work.—The works of the Society include the following:—

1. Publication of the organ of the Society, The "Light of Manchuria."

2. Supply of general information through the Socitey and by other means, giving the results of such investigations and researches as may be conducted in the interest of the development of natural, industrial, and other resources in Manchuria, Mongolia, and Eastern Siberia.

3. To act as guide to intending investors in general in all kinds of enterprises in Manchuria, etc., and also to undertake any special investigation or research on application by promoters of all kinds.

4. To offer facility to travellers on inspecting visits to Manchuria, Mongolia, Siberia, Chosen (Korea), China, etc., to the end of importing accurate information and rendering their observations as close to truth as possible.

5. To use all kinds of means in order to

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propagate the true conditions obtaining in Manchuria, etc., and further to carry on the propaganda work for these regions through the medium of lecture meetings, exhibitions, etc.

6. To compile, publish, sell, and distribute books, pamphlets, etc., bearing on Manchuria and Eastern Siberia.

7. To carry on other works necessary for disseminating information on Manchuria, etc., and also for fostering economic enterprises therein.

c) In carrying on the above work, the Society is divided into the following:—

Secretariate,
Research Department,
Publication Department,
Intelligence Department, and
Accounting Department.

d) Any one wishing to join the Society is requested to send in a written application, giving the name and address, accompanied with the membership fee for not less than three months paid in advance.

e) The membership fee, entitling the member to a copy of the monthly organ, costs 50 sen (½ yen) per month and ¥6 per annum.

Remittances.

All remittances to this Society may be made most conveniently and safely to Transfer Savings No. 2850, Dairen. No receipts for the same will be issued, but instead the Society's monthly organ will be sent.

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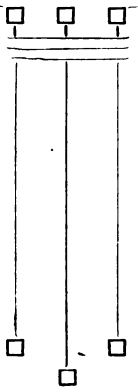

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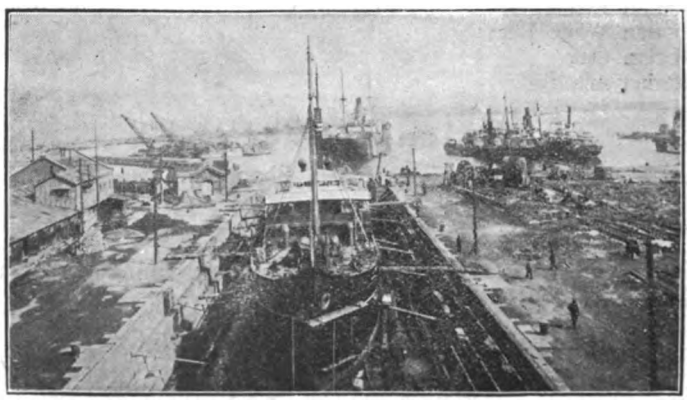

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MANCHURIA ENLIGHTENING SOCIETY (WHOSE ORGAN THE "LIGHT OF MANCHURIA" IS) . . 58-59

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THE
LIGHT OF MANCHURIA

PRESENT AND FUTURE OF BEAN MILLING INDUSTRY IN MANCHURIA.

By Mr. J. Furusawa, Managing Director,
Nisshin Oil Mills, Ltd., Dairen.
(Now on a tour of the West).

The Chinese have been accustomed from early times to use vegetable oils as food and also as a source of light. The expression of oil from Beans has therefore been carried on almost everywhere on a small scale, to meet the local needs. The method of expressing oil has been necessarily primitive. In recent years, Bean Oil has awakened world-wide demand and has come to be exported livelily to Europe and the United States. Then, Bean Cake is in increasing demand from Japan, South China, etc. The bean milling enterprise has thus been fostered rapidly, and mechanical milling has been introduced to Dairen and elsewhere in Manchuria.

About the time, the South Manchuria Railways began to be run under the present Management, the port of Yingkou drew most of the Manchurian produce, and it was the main entrepot of the Manchurian trade. Consequently, the bean milling industry there established itself the earliest, and about the time of the Sino-Japanese War, there were already over thirty mills. But then, donkeys were used to turn the stone mill to grind Beans. The Beans thus ground were steamed and then were put under the hand press.

After the close of the War, Messrs. Butterfield & Swire, the British Firm, foresaw a great future in bean milling. They installed a steam roller and expressed the oil by means of a screw turned by hand. This was perhaps the first mechanical appliance brought to play in Manchuria for the purpose.

Then came the Russo-Japanese War, and not a few Japanese visitors to Manchuria became interested in this industry.

On the close of the War, Mr. F. Kodera (now on the Directorate of the Kodera Bean Mill, Dairen) founded a bean mill worked by hydraulic pressure at Yingkou. Indeed, he was the first Japanese who started mechanical milling in South Manchuria.

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As the railways passed under the management of the South Manchuria Railway Company, it planned to make Dairen the chief gateway of trade and has taken measures to execute its plan. It was under such circumstances that bean mills began to come into being at Dairen also.

The first local mill was the Shuanghochan Mill established at Hsiaokangtzu (Chinese Quarter of Dairen) in 1906. In 1908, the Railway Company announced a system of specific freight tariff to the seaboard ports, and this induced a number of Japanese to follow suit. The Mitsui Bussan Kaisha organized the Santai Bean Mill (above Dairen Wharf compound) conjointly with some Chinese capitalists. About the same time, the Okura & Co., jointly with Mr. K. Matsushita, of Yokohama, founded the Nisshin Oil Mills, Ltd.; The Kodera Mill, Yingkou, too, erected another factory at Dairen, followed by Mr. K. Saito with another mill. In the course of a few years, the mills maintained by Japanese and Chinese numbered about twenty. This industry has kept developing, and now the local mills total sixty.

Looking back to the period about the Russo-Japanese War, as the railway facility was available and export abroad became promising, there were already fifty mills at Fengtien (Mukden), producing 1,500,000 pieces of Bean Cake a year. Next came Liaoyang with 25 mills capable of putting out 1,000,000 pieces of Bean Cake.

In the intervening span of time, prior to the introduction of the specific freight tariff to the seaboard ports, mills sprang up in succession at Tiehling, Kaiyuan, Ssupingkai, Changchun, etc.

But, as the port of Dairen bade for the front place in handling the Manchurian trade, the other towns came to be thrown into background, and from 1909, the bean mills at those points have either shut down or removed elsewhere.

It is true that the wonderful development of bean milling at Dairen at the expense of elsewhere in South Manchuria was in part owing to the Specific freight tariff to the seaboard ports (since abolished), but at the same time the opportunity offered by the great world War, quickening the export of Manchurian products in the matter of Beans and Bean Oil, has done a great deal to boom the enterprise.

Then, when the serious drawback of Yingkou in being ice-bound during the winter, in which the Bean trade is the busiest, is contrasted with the almost perfect equipments installed at the Dairen Wharves, the present prosperity of the port of Dairen may be considered as well deserved.

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According to the "Manchurian Beans," by Mr. Ito, as the result of investigations, there were in 1919 along the South Manchuria Railways altogether 310 bean mills of more or less dimensions, producing amongst themselves 55,169,000 pieces of Bean Cake in addition to 32,390,000 *kin* of Bean meal, and also 256,989,800 *kin* of Bean Oil. (Note: In the above figure, the outputs at Harbin are included). Of the above figure, the total annual outputs of the Dairen mills, numbering 60, amounted to 27,934,000 pieces of Bean Cake, and as to Bean Meal it was exclusively produced at the Suzuki Bean Mill, Dairen. The Dairen quota of Bean Oil for the same year was 136,553,000 *kin*. In both Bean Cake and Bean Oil, the port of Dairen contributed more than 55% of the whole output of Manchuria.

Future of Bean Milling Industry.

It is a matter of only recent date that Bean Oil has pushed itself to the fore as the first article of the Manchurian produce. Judging by the events that have led up to the present growth of bean milling, the steady increase of demand for Bean Cake as fertilizer in Japan may be considered as more responsible for the development of the milling venture than the foreign demand for Bean Oil.

However, it is very doubtful if this enterprise can have thriven so quickly unless Japan has been in want of Bean Cake, whilst the West has called for Bean Oil.

Industrially seen, bean milling is an industry on a modest scale, and its improvement has proved quite slow. Most of the mills now under Chinese management have been founded on the capital of from ¥20,000 to ¥30,000. Along the Railway lines in the interior, there are still some using domestic animals for power and hand presses. For this reason, it requires but little funds to set up this undertaking, and once its profitable nature has become known, many have taken it up. Consequently, a strenuous competition has been apt to be waged among the bean mills, and they are more liable to follow their conservative policy of business than to better their equipments and to try to improve their outputs.

In short, because of the existence of so many minor mills, this business has necessarily become less profitable, leaving little room for improvement or advance.

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To cite an instance, competition in buying Beans will naturally raise the market, so much cutting into the profit of the business.

From the current quotation (in September, 1921), from 100 *kin* of Beans quoted at ¥4.59, the Bean Oil produced is quoted at ¥12 per 100 *kin*, whilst Bean Cake costs actually ¥1.96 or ¥1.97 per piece, which is quoted on the market at ¥1.85. The only hope for the bean mills is to sell the Cake by future contract at a less losing figure.

Piles of Beans on Dairen Wharves.

Such can hardly be regarded as a wholesome phenomenon.

Under these circumstances, from 1912 to 1915 or so, during which term the competition amongst the bean mills was waged most keenly, the local Japanese mill-owners proposed to organize an oil mill trust like similar organizations in the United States as steel and oil trusts, so that the purchase of the required material and the sales of the products might be transacted exclusively by the same trust Management. The Chinese brother-mill-owners were also approached through the Bean Mill Owners' Union to support the idea. But the majority of them remained obdurate. For, they knew they mastered the knack of buying Beans and selling the outputs, and further were afraid of having to dismiss many of their well-trained and dependable men as the result of the organization of the proposed trust. Thus, the project had to be dropped. But when one looks far into the future, the minor mill-owners seem bound to be crowded out of the field by some powerful industrial organization employing the most advanced machinery. The Chinese, who refuse to open their eyes to the moral certainties, may cling to their old outdated ideals until they find themselves fairly beaten out of the field.

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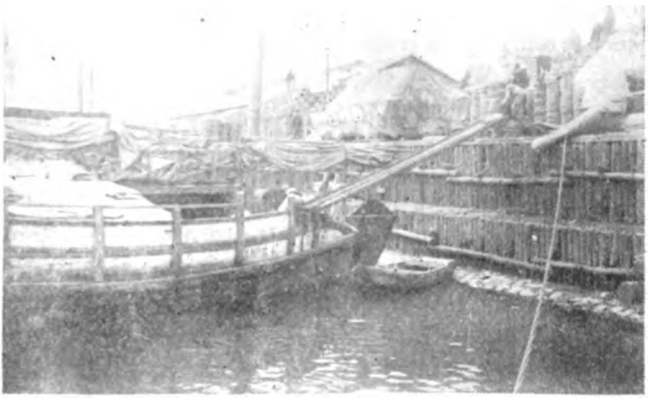
Again, bean milling industry has become developed also in Japan.

During the great world War, Beans put out in North Manchuria found their export to Europe blocked, and North Manchurian Beans were supplied to Japan via Vladivostok ten or twenty sen lower than what was sent via Dairen. On these Beans were worked the new mills founded at Sakai, Shimizu, Yokkaichi, Kobe, Yokohama, etc. The total daily outputs of the mills in Japan were about 20,000 pieces of Bean Cake, in addition to the bean meal produced at the Suzuki mills in Japan, operated on the chemical extraction system similarly to their Mill at Jijiko, Dairen.

Then the Russian Revolution interfered. It threw Siberia into chaos; the railways therein ceased to be dependable; the port of Vladivostok became practically closed; and the eastward transportation of North Manchurian Beans was stopped. This necessarily curbed the bean milling work in Japan.



Loading Goods at Antung Wharves.

Let us now compare the advantages and disadvantages of Dairen and Japan from the stand point of bean milling industry.

In Japan, firstly, the interest rate is lower, and secondly the farmers may get Bean Cake just put out from the mill. These are virtually the only advantages Japan can offer.

On the other hand, Dairen has firstly cheaper labour at command, indeed so cheap that, on the wages for turning out a piece of Bean Cake in Japan, two pieces may be produced at Dairen. Next, in buying Beans, the sundry benefits of the South Manchuria Railway Company's Mixed Storage may be secured.

For these creasons, no matter where else new mills may spring up, the port of Dairen will retain the same position of advantage.

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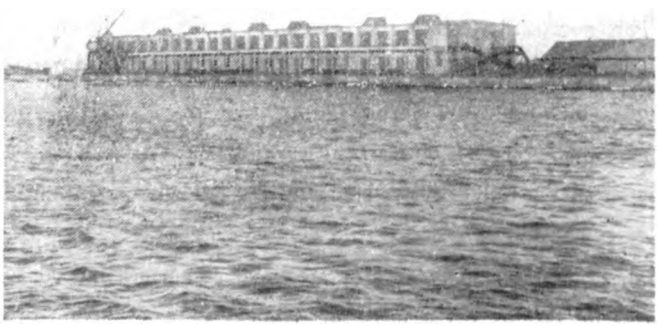
Improvement of Oil-Making Method.

The oil manufacturing methods may be classified into two kinds, viz., the expression method and the extraction system.

All the existing mills in Manchuria, excepting the Suzuki Bean Mill, Jijiko, Dairen, which is the only plant worked on the chemical extraction method, are operated on the expression method.

Under the head of the expression method, there are several ways, beginning with what is generally known as the wedge method, which has been in vogue from early times, the screwing method worked by hand, and also the hydraulic pressure method. In crushing Beans, some mills operate the rollers by steam power, but there are a good number of old fashioned mills where donkeys are still used to grind beans by means of primitive stone mills. Then, in the shape of Bean Cake, most thereof are round, a small number are in oblong plates, rather thin, and what is put out from the Suzuki Mill (worked on the chemical extraction method) assumes the form of Bean Meal. The last mentioned is the most advanced method of extracting the oil. This system was experimented upon for the first time by the S. M. R. Co. General Laboratory people, and proved a success. Subsequently, the experimental mill maintained at Jijiko, Dairen, was transferred to the management of Messrs. Suzuki & Co. in 1917. The Japanese firm introduced an extension to the plant, raising its daily consumption of Beans to 120 tons. Moreover, the same firm founded a like plant at Shimizu (in Shizuoka Prefecture) and also elsewhere.



Good sheds and Warehouses, Dairen Wharves.

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Bean Cake and Bean Plate are produced by the expression system. However, the one that yields Bean Cake (round in shape) fails to express oil to the desired extent, so much detracting from the quality of the Bean Cake, not to speak of leaving no small amount of oil in the Cake. As to Bean Plate, the method that gives it is considerably better than the other expression method. A more powerful pressure is applied to the Beans and a larger amount of oil is obtained.

Bank of Chosen, Dairen.

Correspondingly, the Bean Plate is of a finer quality and can also withstand better transportation over great distances, and even through the tropics. This system used to be employed at the Kabalkin Mill, Harbin, only at one time. But recently the Nisshin Oil Mills, Dairen, too, have erected a factory specially for producing Bean Plate.

The following table gives interesting data for the three kinds of the residue left after the oil has been expressed.

Principal factories	Bean Cake (round) At all places in Manchuria.	Bean Plate (oblong) Kabalkin Mill, Harbin.	Bean Meal Suzuki Mill, Dairen.
Highest pressure applied on one square inch of surface	600-700 lbs.	1,700-2,000 lbs.	Extraction by benzine
Oil percentage to raw material	9.0-10.%	11.5-12.5%	14-15%
Oil percentage left in residue	7.0-9.5%	5.0-7.8%	2.5-3.0%
Moisture percentage	13-19%	10-13%	4-13%

As already remarked, the existing industrial organization of the bean mills is so simple that the fluctuations of the prices of Beans, the raw material, affect the status of the outputs in the dual shape of Bean Oil and Bean Cake or Meal, and,

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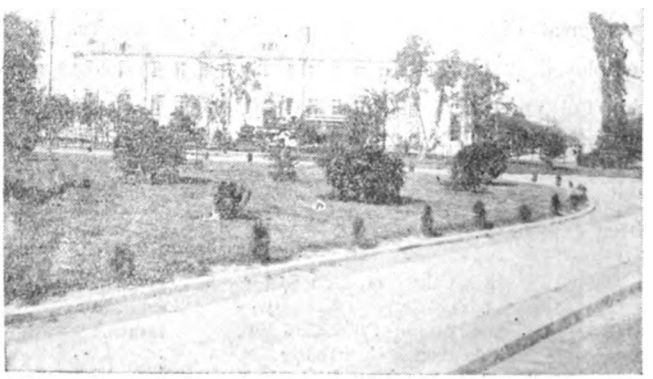
to cite an instance, when Beans rise by 2 sen in price, so much will have to be added to the prices of the products. This makes the mill-owners regulate their business operations by the constant fluctuations of the raw material.

If the industrial process were to require an intricate mechanical treatment, then there would be left room for readjustment between the prices of the raw material and the products, and so there would be less chance of the market quotations of the products getting influenced by those of the raw material.

Such an exigency is to be heartily hoped for by both producers and consumers, but under the ruling circumstances, the market is always subject to some speculative operations, and very often the Dairen quotations happen to be higher than those on the demand markets in Japan.

The long and the short of it all is that the bean milling situation in Manchuria stands in need of improvement in sundry ways. If hereafter both Bean Oil and residue are to be popularized on a lasting reputation as articles of world wide commodity, the production of a superior grade under a mechanical industrial system organized on the most up-to-date basis should be the first thing to be realized, so that the market may be expanded. In fact, it will be no easy task to reorganize the Chinese mills worked in an almost primitive style into mechanically worked plant on a decent scale.



General Post Office, Kwantung Government on Central Circle, Dairen.

However, at least, the existing mills may be so altered as to put out bean plate instead of the circular shaped Bean Cake.

The requirements of the times are believed to create an opportunity for the reorganization of the bean mills, and considering everything, the adoption of the bean plate system is deemed the most desirable.

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Development of other Industries Working on Beans.

Lastly, glancing over the other industries working on Beans, Beans, from their very chemical compositions, are used for making soy, *miso* (made from a mixture of beans, salt, and rice malt and used popularly at the Japanese house holds), *tofu* (bean curd), bean milk, etc. In addition, they are good to make bean cream, chocolate, a substitute for coffee, and sauces.

Next, Bean Cake has varied uses. It is popular as an article of fertilizer containing the three requisites of nitorogen, phosphoric acid, and potassium. Then it is used as cattle-feed. Besides, bean noodles, *sembei* (bean cracker), biscuits, bread, and other nutritive food are made therefrom.

On Dairen Wharves (loading Bean Cake & Beans into steamer).

Again, the recent advance of chemical industry has enabled an incombustible celluloid to be made from Bean Cake to be manufactured into various substitutes of celluloid. Also Beans are used as a material for making substitutes for stone; varnish, and lacquer, paints, a substitute for linoleum, water paint, solite, etc.

Next, Bean Oil is employed as a material for the manufacture of soap, candles, a substitute for India rubber, oleomargarine, paints, toilette oils, water proof tantalus, glycerine, etc., and besides no little quantity is used as a source of light.

As above mentioned, the utility of Beans is very extensive, and the development of these industries using Beans as a material has an important bearing on the expansion of the industrial Manchuria. Therefore, it is highly desirable to work for the improvement and growth of such enterprises.

Even from the standpoint of the local bean mills, if the Bean Oil they put out

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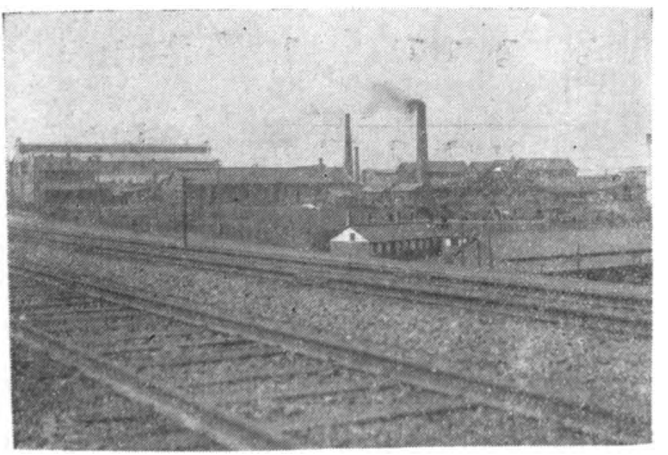
can be refined into table oil, a fresh demand, which may be necessarily of a local character, still of a decent amount, may be exploited.

In recent years, the Nisshin Oil Mills, Dairen, have succeeded in turning out, as a results of painstaking experiments, an excellent kind of oil not at all inferior to olive oil, and the new oil is under manufacture to be offered to sale.

Then, as to soap manufacture, it is expected to grow into a very promising undertaking. The major portion of the soap used in Manchuria is imported from Japan to the total value of about Tael 400,000 a year. If a general demand for laundry soap can be created in China, such a demand will reach a very considerable amount. At present, there are the Manchuria Soap Manufacturing Co. and a few other factories at Dairen, Ryojun (Port Arthur), Fengtien (Mukden), etc.



Ceramic Experimental Institute, S. M. R. Co., Dairen.

Moreover, in view of the gradual rise of industries regarding the making of paints, hardened oil, etc., the development of enterprises for utilizing Beans, outside the becan mills, will be worth following.

BEAN OIL AND ITS PRODUCTS.

By Mr. M. Akita, late of the S. M. R. Co General Laboratory.

1) Material.

Beans, from which Bean Oil is made, consist of a large number of varieties, 214 kinds in all, but may be divided into the three groups of Blue, Black, and Yellow. The Yellow Beans may be subdivided into white eyed, *chinyuan* (of a

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roundish shape), and black-eyed. Blue Beans have two kinds; one kind is blue in appearance and yellow inside; the other is blue both outside and inside.

With Beans belonging to the same kind, there is little difference in the quantity of oil contained therein. The Yellow Beans, compared with the two other kinds, possess the highest percentage of oil; the blue kind comes next, followed by the black kind.

However, even the Beans of the same kind show a variation of oil percentage. The Yellow Beans produced about Kaiyuan are acknowledged to be the richest in oil.

The following is a table giving the percentages of moisture and oil contained in Beans produced in different parts of South Manchuria, as analyzed at the South Manchuria Railway Company's General Laboratory, Dairen, (the name of the analyst being unavailable):—

		1910	1911	1916	1918
Changchun	Moisture...	10.68%	12.87%	9.59%	11.15%
	Oil...	17.33%	17.10%	18.33%	17.13%
Kungchuling	Moisture..	8.30%	11.68%	12.03%	11.69%
	Oil...	16.66%	17.19%	18.85%	17.73%
Ssupingkai	Moisture...	9.98%	11.31%	10.64%	11.93%
	Oil...	17.20%	16.96%	17.75%	18.02%
Kaiyuan	Moisture...	9.30%	12.94%	9.81%	13.11%
	Oil...	19.10%	19.00%	18.04%	18.20%
Tiehling	Moisture..	11.36%	10.85%	9.07%	16.67%
	Oil...	17.8?%	18.00%	18.57%	17.73%
Fengtien (Mukden)	Moisture...	7.00%	10.10%	—	—
	Oil...	17.01%	17.90%	—	—

II) How to Make Bean Oil.

There are two kinds of method of making Bean Oil—one by expression, which has been in use from old times; the other by chemical extraction, the introduction of which method belongs to a recent year.

A. By Expression.

The method by expression is more or less different according to localities, but what difference there is relates to details, the essentials being much the same. What is in vogue in Japan proper is an imitation of the traditional Chinese

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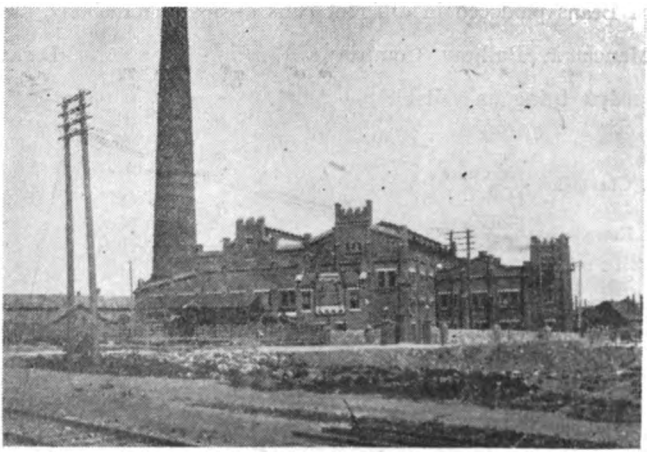
method, only more or less improvement being applied thereto. In recent years, a hydraulic pressure system and other devices of expression have been brought into use in order to increase the oil percentage, and, at the same time, to save manual labour.

In the expression method, there are three different processes. Firstly, the wedge method expresses the oil by means of a wedge. It is quite primitive, but it takes a long time to express the oil slowly and yields a comparatively larger amount of oil. Besides, only a small amount of impurity gets mixed in the oil, and thus the product is of a finer quality. Secondly, the screw method uses a simple screw instead of the wedge. The contrivance is usually operated by hand. That more or less manual labour can be saved, compared with the wedge method, is an advantage. Thirdly, the hydraulic pressure method is a well developed one. Lately, the Anglo-American press, too, has come to be ushered into use.



S. M. R. Co. Electric Power House, Dairen.

Oil Making Methods in Manchuria.

According to the results of investigation by Mr. G. Uyehata (in p. 231, Report I. published by the Central Laboratory of the Kwantung Government, which was the former self of the present S. M. R. Co. General Laboratory), in Manchuria, the following expressing methods are in vogue :—

Crushing : By the use of a simple contrivance like an edge runner, operated by three or four head of donkeys, Beans are rolled into flat pieces about a tenth of an inch thick.

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Steaming: About 46 lbs. of the rolled Beans is taken at a time and put into the steaming kettle to be steamed. Then, the Beans are spread on a piece of hemp cloth for from two to five minutes, and they are then subjected to steaming. This steaming process, in particular, the quantity and temperature of moisture in the Beans, has an important bearing upon the percentage of oil to be produced.

Interior of Bean Noodle Factory, Dairen.

The quantities of moisture, as measured by Mr. Uyehata, are as under:—

Beans, the material		8.63%
Rolled beans		12.71%
Steamed beans	Upper part	17.02%
	Lower part	17.56%
„ „	(average)	17.20%

Expression: The steamed beans are packed in reed spread inside a wooden ring, 57 centimetres in diameter and 30 centimetres in height, and five such rings (*minus* the wooden rings) are put one over another, and they are subjected to pressure. The average quantity of Bean Oil and Cake obtainable from these five rings is as under:—

Bean Cake (5 pieces)		about 240 lbs.
Bean Oil	Yellow Beans	„ 24 „
	Blue Beans	„ 22 „
	Black Beans	„ 20 „

According to the same author, the expression method used by the hydraulic pressure system is practically the same with the above in regard to the preliminary

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operations which the beans are to undergo. Only, in expression, from twenty to forty packages of steamed beans are put under the hydraulic press, which gives a pressure of about 1,500 lbs. per square inch on an average.

Bean Expressing Method in Japan.

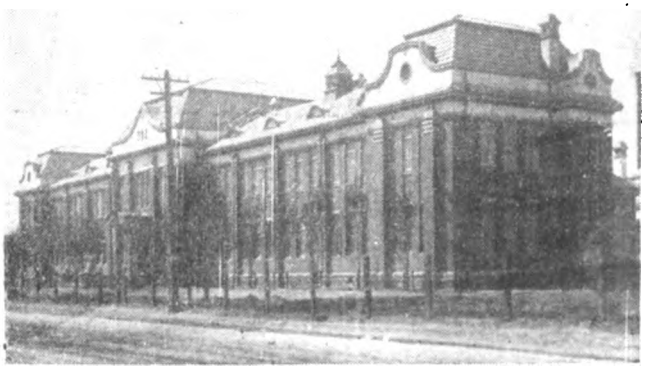
The report (p. 223, Volume 7, of the Industrial Chemical Review, 1904) by Mr. M. Tsujimaru says that the bean expressing method in Japan is an improvement on the Chinese method and is in effect as follows:—

Elimination of impurities: After the lighter impurities have been blown off by means of a fan, the beans are put on a metallic sieve to get eliminated of the heavier impurities.

Rolling: The beans are then rolled flat by means of a couple of rollers.

Steaming: The rolled beans next undergo direct steaming.

Expressing: About 2 *to* (2/10 *koku*, 1 *koku* being equivalent to 4.96 bushels) of the steamed beans is packed in a piece of cotton cloth, and then in reeds inside an iron ring. Five such rings are put, one on top of another, and are pressed. The quantity of Beans under the same press is about 1 *koku* (4.96 bushels), from which 7 *sho* (7/100 *koku*) of oil is put out.



S. M. R. Co. General Laboratory, Dairen.

Mr. Y. Nishiyama (in p. 66, Vol. 11, the Industrial Chemical Review, 1908) says that, in addition to the above mentioned process, a new method known as the roasted method is used mostly in Miye Prefecture (Province of Ise, in which the Ise Grand Shrine is located). By this method, beans absorbing a little more than an ordinary percentage of moisture are rolled by roller and then ground by a mill. Next, the beans are roasted for

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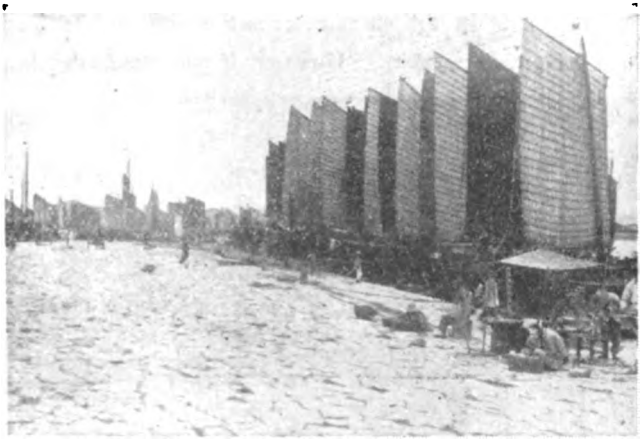
about twenty minutes and then pressed. About 1.5 *to* (15/100 *koku*) of oil is said to be obtainable, but Mr. Tsujimoto has doubt about so great an amount of oil being yielded. The oil is, at all events, procured in a larger quantity, but owing to the roasting of beans, the oil is said to wear a dark brown colour.

B. By Extraction.

In the chemical extraction method, a solvent of volatile nature is employed. After the oil contained in the beans has been extracted, the mixture of the oil and solvent is subjected to a high temperature. The solvent is then evaporated, leaving the oil.

The common solvent used is benzine. The introduction of this chemical method is an event of comparatively recent years. In Manchuria, the Suzuki Bean Mill at Jijiko (Dairen) is the only plant worked on this system. Of late, there have been a few projects to found a like mill.



Junk Wharves, Dairen.

This extraction method was first invented in Germany. The South Manchuria Railway Company, alive to the promising character of the new invention, sent Mr. G. Uyehata of the Company's General Laboratory, Dairen, to Germany to investigate it on the ground. In March, 1914, the Company established an experimental mill at Jijiko at the east end of Dairen. The new plant proved industrially and commercially workable, and on September 1, 1915, it was transferred to Messrs. Suzuki & Co., to be maintained as a private enterprise.

It is the first bean mill worked on the chemical extraction system under Japanese management.

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This same method is operated roughly on the following lines:—

Separation of impurities: As Beans generally contain impurities such as dirt, earth, etc., they are bolted over a double-meshed sieve, the upper sieve having larger meshes than the size of beans, and the lower sieve having smaller meshes. Impurities larger than beans will be left over the upper sieve, while the smaller-sized impurities will be sifted through the lower sieve.

Drying: Iron revolving driers of cylindrical shape are used and steam power is brought in for the drying of Beans. The steam pressure brought to bear is ordinarily 4 or 5 lbs. and the time wanted for the drying process is about two hours.

Rolling: In the chemical extraction system, the beans must be crushed as in the expression system. However, if pulverized, the beans will not have an even and complete contact with the solvent, and therefore no perfect extraction can be hoped for. Moreover, the separation of the solvent from the bean meal left, after the extraction of the oil is over, will be attended with difficulty. So, in the extraction system, too, the beans are put through a couple of crushers so as to be made flat.

Dairen Produce Exchange.

Extraction: Ordinarily a set of four extractors is used, through which the solvent is kept in circulation in such a manner that the nearer the beans are towards the complete extraction of the oil, the fresher will the solvent be.

To cite a practical instance, fill the first extractor with crushed beans; apply fresh solvent to the second extractor; put in the first extractor the solvent, which

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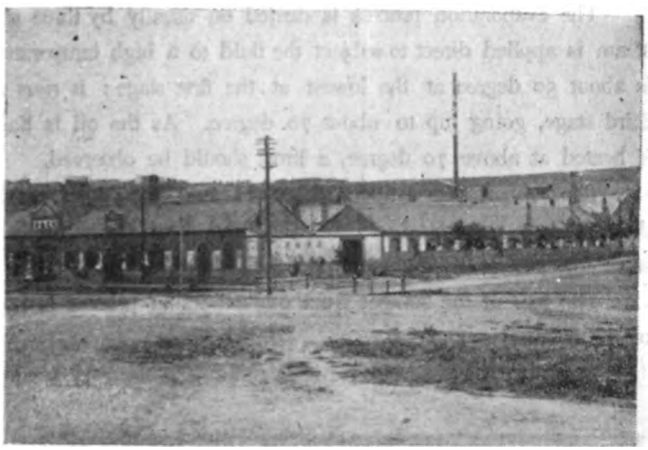
contains the largest amount of oil after passing through the two other extractors; on the lapse of a certain length of time, the bean meal in Extractor 2 is removed after its separation from the solvent; put in the same Extractor a fresh supply of crushed beans; into Extractor 2 transfer the solvent in Extractor 1; and then transfer the solvent from Extractor 4 to Extractor 1, and from Extractor 3 to Extractor 4; next put fresh solvent into Extractor 3; the solvent that has completed the extracting operation for the fourth time and has been discharged from Extractor 2 is sent to and stored in the benzine reservoir.



Chinese Bean Mills, Dairen.

The above process is repeated.

The beans charged into an extractor, after undergoing four stages of extraction, are discharged in the form of bean meal, whilst the solvent itself, after completing its fourth extracting action, is transmitted to the reservoir for storage. Now, the duration of time, during which the solvent is kept in touch with the beans, is to be 15,130 minutes. Therefore, the beans in each extractor are left in contact with the solvent for 112 hours in all. Next, the same length of time, or 15,130 minutes, is wanted after beans are charged into an extractor and before the bean meal is discharged. Thus in order to complete the working of each extractor, 224 hours are required.

Solvent and Discharge of Bean Meal: On the completion of the oil extracting process, the solvent that has done most of the work assigned thereto is let out, and after the solvent has been separated from the meal nearly completely under reduced pressure, steam heat is brought into play so as to evaporate what solvent has still been left in the meal, and then the meal is removed. The meal is put on the market after being dried by steam.

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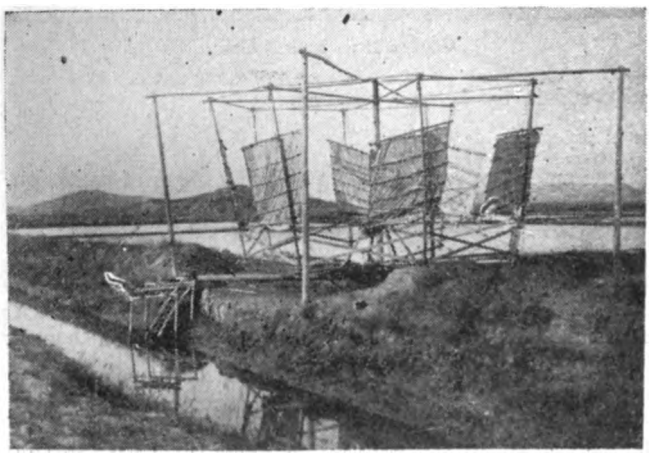
Distillation of Solvent: The solvent containing oil that has been discharged from the extractors, sometimes known as fatty solvent, is gathered into the same reservoir, to be sent whence to the evaporation kettle in which to get the solvent evaporated, so as to be separated from the bean oil.

The evaporation process is carried on usually by three stages. In each stage, steam is applied direct to subject the fluid to a high temperature. The temperature is about 50 degree at the lowest at the first stage; it rises to the highest at the third stage, going up to about 70 degree. As the oil is liable to be discoloured if heated at above 70 degree, a limit should be observed.

The solvent thus evaporated passes into the cooler together with the vapour, then to get condensed, to be separated from the water by means of the water separator, and to be gathered into the reservoir.

The loss of the solvent from one extracting process is nominal and only 1% of the original amount.

Refining of Oil: No particlar refining process is used. The oil is allowed to stand still merely, so that the various solid impurities may settle, and then the clear portion of the oil is placed on the market.



Wind Mill at Salt Fields, Pulantien.

Solvent: Usually, benzine on the market is employed as solvent. This article varies in boiling point, that of some kinds rising over 100 degree. There-fore, before being put in use, it ought to be distilled so as to obtain only such as may be distilled at or lower than 80 degree.

Again, benzoline has its boiling point uniformly fixed, and owing to this advantage, it is often used, but, at the same time, this solvent has the power to dissolve the colour and is therefore liable to colour the product.

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Comparison with the Expression Method. By means of the Extraction method, the major portion of oil contained in Beans can be extracted, and when worked properly, about 14% of oil is obtainable. With the Expression Method, the average oil percentage to be had is only 9% on an average, being about 5% less than available by the Extraction Method. Further, Bean Meal given by the Extraction Method contains a comparatively smaller portion of albumen and other impurities. Besides, the oil is of lighter brown and of finer quality. As indicated by the name, the residue assumes the form of Bean Meal which has a less percentage of oil, and for this reason, it has a higher fertilizing value. Next, Bean Meal saves the trouble of breaking as in the case of Bean Cake.

All these advantages seem to commend the Extraction Method, but it employs the expensive benzine and the manufacturing process is very complex, and on that account a larger operating cost is required.

An accurate comparison of the two Methods may be made only after a minute investigation has been made about the operating costs of the two systems, the qualities of the outputs, etc.

The following is the table of analyses of Bean Cake and Bean Meal produced in Manchuria :—

	Bean Cake		Bean Meal			
			Observed by			
	Uyehata	Uyehata	Koenig	S. M. R. Co.	General Laboratory	
Moisture	17.53	19.18	13.4	15.33	9.26–14.5	9.92
Fat	7.40	9.17	7.5	9.63	2.44–5.46	—
Albumen	48.85	45.01	40.3	42.12	43.37	44.83
Carbohydrate	15.97	15.62	—	22.00	—	—
Vegetable fibre	5.24	6.23	5.5	5.39	—	—
Non-nitrogenous extract..	—	—	potassium 2.81	potassium 1.78	—	—
					phosphoric acid	
Ash...	5.98	4.76	5.2	5.42	0.57	5.80

The results of minute investigation of Beans, as conducted by Mr. S. Sato (as published in p. 952, Vol. 22, the Industrical Chemical Review, 1919) are briefly as follow :—

Effect of the Skin: The skin varies in colour from brown to green and to black. The colour of the skin lixiviates in the solvent, lending the oil a foreign tint, thereby lowering its quality. Next the existence of the skin reduces the

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contact surface between the globular fat present in the cellular tissue of Beans and the solvent, causing a delay in the extracting process, and consequently lowering the amount of the oil to be had.

From experiences, the amount of fat prevented from extraction by the skin maintains a fixed ratio to the total amount of oil and is indicated by the constant of 7.3%. In the case of the extraction process lasting for a short space of time, the percentage differs according to the kinds of Beans, ranging from 7.5% to 12%.

Pack Donkeys.

Effect of Moisture: The effect of the moisture contained in Beans may be gauged chiefly by the extent to which the solvent mixes with the moisture. With a solvent which is hard to mix with the moisture, the presence of the moisture in the Beans materially impedes the permeation of the solvent and also the lixiviation of the globular fat in the cellular tissue, resulting in the reduction of the oil percentage obtainable.

Practical experiments show that the use of benzine as solvent upon Beans yields the largest amount of oil when the moisture contained in the Beans is 7.52%, and also that up to the increase of moisture to 12%, no notable difference is discerned. Therefore, it may be concluded that moisture may be tolerated up to 12%. Next, the oil percentage available is observed to decrease as the time of drying Beans is longer. So their drying after being crushed should be avoided as far as possible.

If Beans are found to contain over 13% of moisture and are considered to require a little drying, they should be dried in their original form, and not after being crushed.

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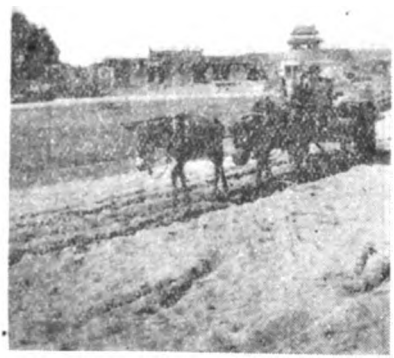
Effect of drying after crushing: From the experiments above mentioned, the oil percentage available is markedly affected, in addition to the moisture percentage, by the degree of drying of Beans. This is perhaps due to the decrease in solubility from either oxidization or other chemical composition of the oil while coming in contact with the high temperature air during the drying time.

As a result of another experiment, in which Beans have been dried under a reduced pressure so as to neutralize the atmospheric effect as much as possible, and the relation between the quantity of moisture and of the oil extracted has been studied, it has been found that the oil percentage available is inversely proportionate to the moisture percentage. However, whether the decrease of the oil yield from drying in a high temperature air is owing to the oxidization of the fat or some other chemical composition remains unascertainable.

Comparison of Solvency of Different Kinds of Solvents:

The loss rate of the solvent forms one of the chief economic considerations to be weighed in the extraction of the oil. But this loss rate is closely related to the speed of solution of the solvent, thus requiring the comparison of the solvency of the different solvents.



Chinese Cart.

The comparison of the speed of solution by means of different kinds of solvent under the same conditions is as under:—

By means of	Available percentage to total oil amt.	Rate of Solvent
Carbon bisulphide	27.25 per cent.	100.00
Ether	25.51 „	93.61
Petroleum benzine (of 75 degree) ...	22.15 „	81.28
Carbon tetra chloride	17.39 „	63.82

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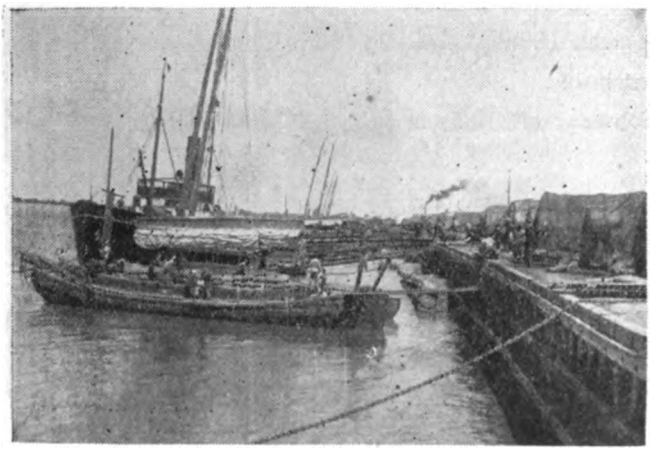
The above table shows that carbon bisulphide has the highest solvency to Bean Oil, but this solvent, lixiviating brownish colour to a remarkable degree, is not desirable. Then, ether is expensive and besides has a low boiling point, raising the loss rate on that account. Therefore, benzine is pronounced as the most suitable solvent.

Conditions Regarding Extraction of Oil.

Quality of Petroleum Benzine as Solvent: As solvent, petroleum benzine ought to have a uniform boiling point as far as possible. Such kinds as may be distilled at between 75 and 80 degree are pronounced as the most suitable. Any that is distillable at below 50 degree is feared to aggravate the loss of the solvent. Then, such as take a temperature higher than 100 degree will be difficult of being separated from the Bean Oil and is liable to remain in part in the oil.



South Manchuria Railway Co.'s Wharf at Newchwang.

Relative Quantities of Beans and Solvent. Beans and petroleum benzine may be used together at any given ratio. For crushed or rolled Beans, no large amount of solvent is required. The results of experiments indicate that, for rolled Beans of 50 grammes, petroleum benzine of 130 c.c. is just enough.

Time required for extraction: Experiments have shown that the amount of oil obtainable is proportional to the time laid out for extraction. This denotes how difficult it is for the solvent to enter into the cellular tissue of the Beans and, at the same time, what impediment attends on the expulsion of the fatty solvent out of the cellular tissue. Therefore, in order to quicken the extraction of the oil,

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the tissue of the Beans should first be completely destroyed, so as to factilitate the permeation of the solvent and also the removal of the fatty solvent.

Temperature for extraction: Experience teaches that the temperature has an important bearing on the amount of oil available, in fact the temperature being the most important of the conditions for the extraction of oil.

The higher is the temperature of extraction, the larger quantity of oil is obtainable. But the practicable temperature is placed at between 40 and 45 degree, and any rise above this will cause the solvent to evaporate.

Stirring up: It needs constant stirring up in order to raise the rate of lixiviation of the oil. Many experiments have been conducted to study the relation between the times of stirring-up repeated and the oil amount obtainable, but nothing worth noting specially has been found. It will suffice for the purpose to keep the solvent and the Beans constantly moving. Any excessive stirring-up will break up the tissue of the Beans, bringing in a train of difficulties in the sundry operations.

From all the above mentioned experiments, the following conditions for the extraction of oil have been obtained:—

1. Amount of solvent: Enough to cover the Beans.
2. Temperature: 40-45 degree.
3. Time for extraction: 1½ hours.
4. To be stirred up within the bounds that the tissue of the crushed Beans is not broken up.

Repeated extraction: As to the times of repetition of the extracting process, experiments give the following data:—

1st time	42.80%	of all oil contained.
2nd time	15.52	,,
3rd time	6.30	,,
4th time	3.40	,,
5th time	1.84	,,
Total amount of oil	69.90	,,

Judging by the above results, the oil to be had at the fourth and fifth times is too small for the loss of the solvent and the amount of labour required, so these two repetitions may well be done away with. In a temperature from 15 to 20 degree, the total oil amount procured by the first three extracting processes is only 64.62%. But, at about 40 degree, the oil percentage may be raised to 80% or more.

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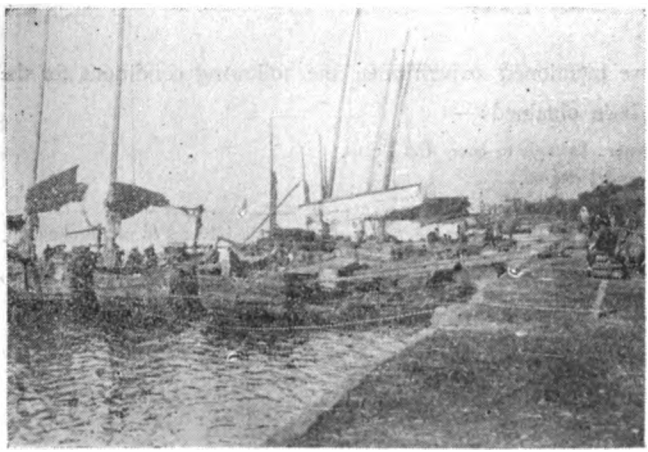
Mr. Sato has deduced a conclusion to the following effect:—

(1) The most important consideration in the extraction of the oil consists in how far the cellular tissue of Beans should be broken up. On this point mainly hangs the facility of the extracting of oil and also the efficiency of the power to extract oil. In order to attain this end, crushing rollers of large diameters should be selected, and the number of their revolution should be minimized, and the space between any two rollers may be kept at ½ millimetre.

(2) Next to the breaking up of the cellular tissue, the most important thing is to keep the temperature at between 40 and 45 degree, at which degree the speed of permeation of the fatty solvent is remarkably increased, besides the time required for the extraction is shortened, at the same time the amount of oil obtainable being increased. By regulating the temperature at a suitable degree, a greater quantity of oil than may be had from the use of a larger amount of the solvent and also from the extension of the length of time for extraction may be made available.



Chinese Maritime Customs, Newchwang.

(3) The time for lixiviation may chiefly vary according to the extent to which the cellular tissue of Beans has been broken up, but in ordinary circumstances, from 1.5 to 2.0 hours is accepted to answer the purpose fully. Any further prolongation of the time does not bring in any increase in the oil yield worth speaking.

(4) The quantity of the solvent to be used ought to be just enough to cover the Beans completely. The amount of the solvent used influences that of oil obtainable only inconsiderably.

(5) The extracting process need not be repeated more than three times.

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(6) In order to accele rate the lixiviation of oil, either solvent or Beans or both of them may be stirred up to advantage. But if the Beans are kept still, whilst the solvent is kept in motion, the solvent will have the tendency to pass through the channel offering the least resistance, thereby making against a uniform extraction. On this account, it is most desirable to stir up both solvent and Beans at the same time. The stirring-up ought to be kept within the bounds not to pulverize the Beans.

III) How to Refine Bean Oil.

No special refining is needed in the case of Bean Oil. It will suffice to store it in a large reservoir, leaving it still for a few days, and then to take off the clear part for the market. If the reservoir is heated indirectly by means of steam, the precipitation of what impurities there are in the oil will often be facilitated.

Asiatic Petroleum Co., Newchwang.

However, the refining of oil merely by settling leaves some of the albumen and other impurities in the oil. On this account, the oil will sometimes get turbid again as time goes by. Besides, such oil is liable to get deteriorated. Bean Oil, when fresh, has an agreeable smell, but a few days later, it will take on an odour like that emitted by sugar. This odour will grow stronger as time goes on. When oil has much impurity, a new odour reminding one of a burning smell will be added. If kept in a high temperature, the above changes will be noticed to take place more quickly, and it will assume a disagreeable taste, making it unfit for table use. The oil will gradually take on a darker tint, turning to dark brown at last.

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Mr. S. Nishiyama (in p. 761, Vol. 11, the Industrial Chemical Review, 1908) gives the results of his experiments about the refining of Bean oil according to the various popular methods.

(1) Refining by means of Sulphuric Acid.

Mr. Nishiyama, in accordance with the Thenard system, vigorously stirred up strong sulphuric acid of about 1% at the temperature of about 25 degree, and mixed it with Bean Oil. Then the mixture was washed with tepid water and was left alone. The separation of the oil from the water proved anything but distinct. Neither was the colour of the oil improved. Moreover, the loss of oil from the washing process and the subsequent separation amounted to some 7%.

Next the Cogan method was tried and sulphuric acid diluted to twice its quantity was used as refining agent. But, no better results were obtained.

Mr. Nishiyama attributed these failures probably to the refusal of the colour of Bean Oil to be acted upon by sulphuric acid.

(2) Refining by means of Soda.

Caustic soda of about 2% to the Bean Oil was applied as a solution at the specific gravity of about 1.2, and then this mixture was stirred up well. Then the mixture was found to assume the appearance of milk. Next, water of twice the quantity of the mixture was added and was left still after another good stirring up. The separation of the oil from the water progressed slowly. After a week, the water was taken off and the oil was filtered. This method produced foot, and in addition some of oil entered into the water in emulsion, causing no little loss of

Sheep grazing on Manchurian meadow.

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oil. The application of steam was found to help more or less in separating the oil from the water layer. Still, it could not prevent the loss of no little oil. Moreover there was no improvement in the colour of the oil, and this method was considered as unsuited for the refining of Bean Oil, except in the case of refining deteriorated oil containing free acid in a large quantity.

(3) Refining by means of Clay.

Mr. Nishiyama, as the result of his experiments, learned that this method was the most successful in refining Bean Oil as in the case of other kinds of oil. He used "Kambara" clay, dried and pulverized. Some 10% of clay was put in Bean Oil heated up to about 80° while being stirred up, and, after half-an-hour's continued stirring up, the mixture was left still for two days. In the mean time, the clay got settled completely. The clear oil was then filtered, and the oil became perfectly clear, although the decolourization process was not yet complete. The loss of oil was about 10%. Then about 15% more of clay was applied, resulting in a considerable decolourization, but attended with the loss of oil to 14%. The larger amount of clay is used, the more complete is the decolourization, but, at the same time, the larger is the extent of loss of oil.

In ordinary refining, 10% of clay may be enough, but in order to complete the decolourization, more than 15% of clay must be used. The clay left after the filtering may be burnt and used as a black paint for the use of artists.

(4) Refining by means of Sunlight.

Bleaching is the chief object of this method. Oil is put in a shallow vessel and is left under the direct rays of the sun. In about 30 days' time, considerable decolourization was noticed. The oil was left in the same condition for thirty days longer, but little further decolourization was observed.

The oil subjected to this refining method had its acid value remarkably increased as it was kept exposed to the sunlight.

The results of observation were as under:—

Original Oil	0.55	in acid value.
Exposed to the sun for 30 days	1.01	"
Exposed to the sun for 90 days	4.62	"

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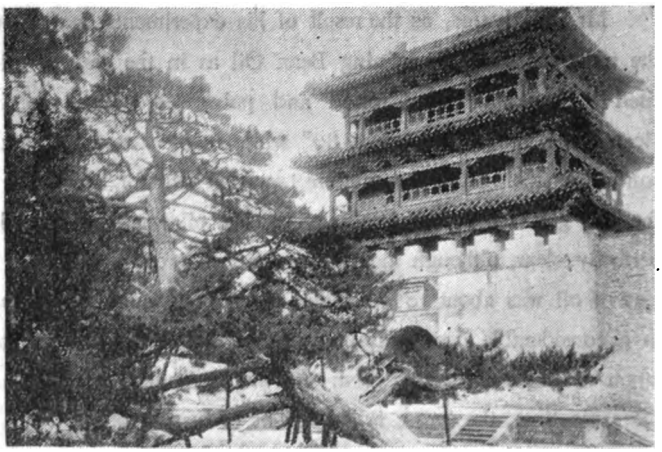
Thus it may be said that, whilst this method is valueless for the refining of Bean Oil, it is perfect as bleaching method, although the requiring of a long time and the increase of the acid value are its disadvantages.

(5) Refining by Heat.

When Bean Oil is heated up to about 200 degree, its colour will get dissolved, while the oil itself will assume a greenish colour from chlorophyll. However, if the application of heat lasts long, it will impart to the oil a dark brownish colour. If air is sent in to let itself keep in touch with the oil while heat is applied, a greater effect will be had.



Eastern Mausoleum near Mukden

This method can hardly be called a purely bleaching method, but it will carry out a decolourization process comparatively well, if set about properly, and the oil will not resume its original colour. Therefore, this method may sometimes be found handy.

Mr. Nishiyama, besides the above, used bleaching powder, potassium dichromate, etc., for the purpose of bleaching, but none of these experiments is said to have given satisfactory results.

In short, according to his investigations, for the refining of Bean Oil, the clay method is preferred, and for its bleaching, the sunlight and the heating method appear commendable.

Mr. G. Uyehata (in p. 233 Vol. 1, the Kwantung Government Central Laboratory Report) says, regarding the refining of Bean Oil, as follows:—

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(1) Precipitation Method and Sunlight Bleaching Method.

These have both been in vogue.

Bean Oil may be kept for a few days in the reservoir on its being expressed, and when the impurities have quite settled down, the upper clear part may be separated from the rest. This settling process may be accelerated by inserting a steam pipe in the oil, or else oil may be kept in a shallow vessel of a broad surface, and be left exposed to the sun, so as to precipitate the impurities and, at the same time, to effect more or less bleaching. Still either method can scarcely be called satisfactory. Experiments tell that this precipitation method cannot eliminate all the albumen, etc., dissolved, and on this account, as time passes by, foul settlings appear, deteriorating the oil.

Then, to keep Bean Oil in a temperature above 55 degree for a long time is liable to increase the free fatty acid. It is therefore preferable to allow the temperature of the oil to fall to a suitable point and then to filter it by means of a filter press.

Next, the property of the colour of Bean Oil to be unstable to light may be turned to account for bleaching purposes. But, this process works slowly, indeed too slowly to be applied to an extensive undertaking on an industrial scale.

The results of experiments are as under:—

Depth of Bean Oil layer	How far decoloured	No. of days	Time of exposure to the sun
0.3 centimetres	Light yellow	14 days	101.5 hours
0.4 „	„	17 „	123.5 „
0.6 „	„	23 „	154.5 „
0.7 „	„	28 „	170.5 „
0.8 „	„	54 „	319.5 „

Remarks: The temperature ranged between 15° and 18°. The experiments were conducted from September to October, 1909.

The above table indicates what a difference the increase of only 1 centimetre in depth of the oil layer means to the progress of decolourization. It was also noticed that the painting of the bottom of the vessel black somewhat quickens the decolourization process.

The effect of the daylight bleaching method on Bean Oil consists, as in other like instances, in the increase of specific gravity, visicosity, and acid value and the decrease of iodine value.

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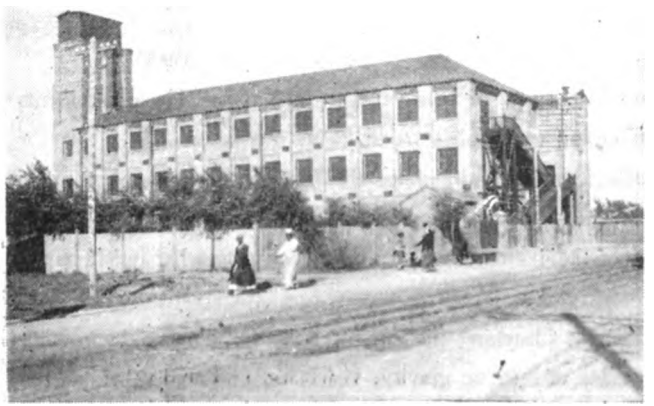
(2) Refining by means of Acids.

The action of thick acids, particularly sulphuric acid on Bean Oil, as in other kindred cases, readily dissolves and carbonizes albumen and vegetable colours. Only, this method is often attended with other noxious secondary reactions, which will debase the quality of the oil.

When Bean Oil is refined by means of sulphuric acid, a disagreeable pungent smell is imparted, which will not be altogether removed even if washed well in water. Moreover sulphuric acid works a destructive action on the oil itself and also its albumen, although it produces but a trifling effect on the colour.

Therefore, it is extremely difficult, technically speaking, to effect decolourization by means of sulphuric acid. On the contrary, it not only imparts a dark brownish hue to the oil, but also will render the separation of the oil layer from the sulphuric acid more difficult.

Talking of the effect of sulphuric acid, its action, when its specific gravity is between 1.8 and 1.5, is materially the same. It acts easily and causes the colour of the oil to change from green to brown. When the specific gravity of sulphuric acid is less than 1.4, its action is slow and little secondary reaction will be observed. But, as the temperature rises, its action will be perceptibly accelerated. For instance, if 0.5% of sulphuric acid of 1.80 in specific gravity is mixed with Bean Oil at normal temperature (that is, 18°), the oil will take on a deep green colour, emitting an odour suggestive of sweets, and passing, in a few minutes' time, into brown. But, sulphuric acid, at about 1.45 in specific gravity, will not produce such action at once. However, when subjected to a temperature of over



British American Tobacco Co., Mukden.

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70°, the effect will be the same as in the case of a thicker sulphuric acid, changing the oil to green immediately. Thenard's strong sulphuric acid (66° Be) should not be used, as it causes a violent destructive action and always gives the oil a brown hue.

An attempt was then made to prevent the noxious action by adopting the Cogan method, by which the temperature was raised a little and a thin sulphuric acid (50%) was applied. Little effect was observed. So was little decolourizing result noted.

There are several methods for counteracting the destructive action of sulphuric acid, but none of these, applied to Bean Oil, has shown good effect.

The use of something like volatile oil as (Mill: D. R. P. 75567) for solvent, and the prodution of ethyl sulphuric acid by mixing Puscher's sulphuric acid with alcohol both ended in failure. Other different methods were resorted to, but none of them answered the purpose of refining.

Threshing Kaoliang.

(3) Refining by means of Alkali.

Concentration of Alkali: In refining Bean Oil by means of alkali, the refined product is liable to form an emulsion with alkali, and in many cases, the separation of the two from each other becomes difficult. This is very often influenced by the concentration of alkali.

Now, about 1-5% of alkaline solution exceeding the acid value of the original oil is mixed well with original oil at normal temperature. Then the temperature is raised slowly to 55-60°, and the mixture is stirred up for about 50-60 minutes, then being left still at a warm spot.

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The condition of the separation of the oil layer from the other is as follows :—

Be 6-10 degrees: Oil layer is barely separated only under the most suitable temperature and when stirred-up properly.

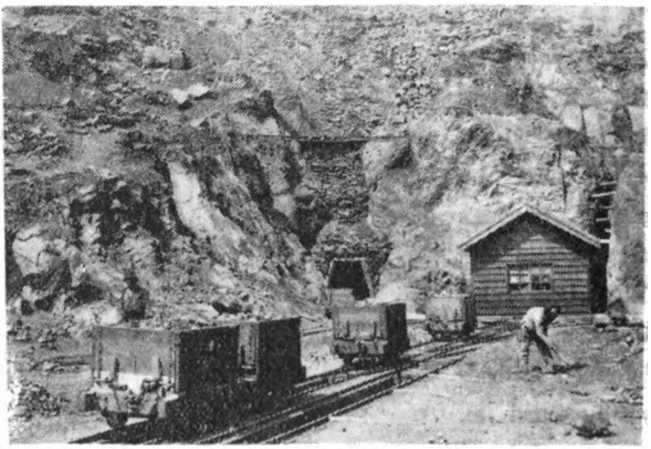
Be. 10-20 degrees: The separation process is somewhat facilitated. In three or four hours, a somewhat turbid oil layer is crystallized out near the surface, the soap so formed getting congealed and settled slowly.

Be. 20-25 degrees: The process is markedly facilitated.

Be. 25-30 degrees: The precipitating process is the speediest and easiest.

Quantity of alkali used. It may be taken for granted that the acid degree of the original oil varies according to the degree of concentration of the alkaline solution used. But, actually the amount used may be at least between 1% and 2%, and when 3% or 4% is used, the process is facilitated most.

Temperature : Although 55-55° is held as the best suited temperature for refining Bean Oil, it may be found necessary to raise it to 55°-70° in order to quicken the precipitation of the soap formed.



Yingtaoyuan Iron Mine Pit, Anshan.

When refined below 50° in temperature, the oil will preserve its fine flavour, but the process is made rather difficult.

If bleaching is the main object, the temperature may be raised to 80°-95° to advantage, but this will be done at the loss of a larger amount of oil from bleaching.

Mixing with Alkaline Solution: To mix Bean Oil with Alkaline solution, the mixing may be effected at a low temperature, and then the temperature may be slowly raised.

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Or else, the original oil may first be warmed up to about 30° and then the alkaline solution may be applied. The results of experiments have shown that there is little to choose between these two methods.

The use of alkaline solution of different degrees of concentration in the same refining process causes no difference from the use of the same solution only of varied degrees of concentration.

However, in the case of original oil containing much free acid, its loss from refining will be found to be reduced more or less.

Stirring-up: The contact of original oil with alkaline solution forms a most important condition for refining. So is the stirring-up, which, moreover, facilitates the settling of the precipitates formed.

Physical character of crystal: The physical character of the saponified matter crystallized out in the refining of Bean Oil by means of alkali has a marked bearing upon the same method. The composition and density of the crystal is greatly influenced by the degree of concentration of alkaline solution, its quantity, and how the refining process is effected.

Hay harvested at Kungchuling Agricultural Experimental Station.

1) When alkaline solution of over 30° Be. is applied, a congealed mass of soap in a small quantity is crystallized ont. The soap is found a dense crystal.

2) When alkaline solution of 6°-15° Be. is used, the crystallization out of the saponified matter is anything but easy, and it assumes the form of a coagulated mass.

3) When alkaline solution of between 15° and 30° Be. is used, something like a mean between (1) and (2) will be brought forth.

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Then, any rise of temperature under which the process is conducted will quicken the congelation of the saponified matter. Next, the effect of such mechanical processes as stirring-up, etc., on the physical character of the crystal is very great, and so is the effect on the whole refining process correspondingly notable.

Loss of Bean Oil from Refining: The amount of loss of Bean Oil from refining is closely related to the composition of the crystal above mentioned. There is only a little difference in this respect between old and new oil used. Generally speaking, with old oil, which contains a larger amount of free acid and has become more or less deteriorated in quality, the loss amount is larger than in the case of new oil.

The results of experiments are as follow:—

New Oil: About 1.0 in acid value.

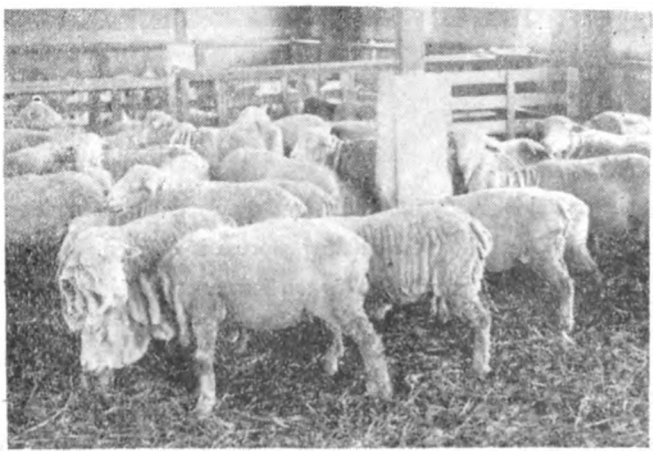
When the composition of the crystal is of much density, the loss amount of Bean Oil is 6-9%.

When the crystal is frothy, the loss amount ranges between 8 and 10%.

Old Oil: More than 5.0 in acid value.

The loss amount is 10%.

In any of the above mentioned cases, the saponified matter formed reaches about 55% of the total oil and is available as soap making material.



Interior of Sheep's Pens, Kungchuling Agricultural Experimental Station.

Flavour of Products: In case of alkaline solution of over 20° Be. being used, and the temperature being raised up to about 40°, a peculiar smell, somewhat bitterish, is imparted to the Bean Oil. The case will be found to be the same when alkaline solution of about 7° Be. is used, and the mixture is heated above 50°.

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Most part of the smell can be removed subsequently, by washing in warm water. But if a thick liquid is applied, accompanied with a high temperature, this smell will be found difficult to be taken off, and a taste reminding one of soap will be retained.

Generally speaking, Bean Oil, compared with other kinds of oil, has the characteristic of being very sensitive to any substances, with which it may be brought to contact.

Separation of Oil Layer. Several devices have been tried in order to effect the separation of the oil layer. The most efficacious is to apply pressure over the surface of the liquid. The application of steam of 1 atmospheric pressure per square centimetre on the surface of the liquid for half an hour will effect the desired separation almost perfectly. The passage of steam of ordinary pressure through the mixture will not bear so good a result, and moreover it is liable to cause a dissolution of the oil.

Mountains of Beans in Changchun Station Yard.

The loss amount resulting from the application of pressure, as above mentioned, is found somewhat smaller, compared with the ordinary method.

The results of practical experiments are as under, with the acid value of the ordinary oil at 0.97 :—

	Caustic soda	Sodium carbonate
Concentration (Be.)...	20°	30°
Quantity used	7%	9%
Steam pressure per square centimetre	1 atmospheric pressure	1 atmospheric pressure
Length of time...	30 minutes	30 minutes
Oil percentage...	97.6%	92.2%
Loss amt from refining	2.5%	7.8%
Acid value	0.49	0.07

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Washing: It is generally commended to use about 20-30% of warm water at the temperature of 50°-60° after subjecting the Bean Oil to the alkaline refining process. However, it often occurs that the separation from the oil is rather difficult. In such case, salt water of about 5° may be used to advantage.

Products: Alkaline refining chiefly aims at improving the quality of the Oil, and leaves much to be desired in the line of bleaching.

Bean Oil, which has undergone the refining process, is found neutral and is observed to have its acid value increased and its flavour changed but little from the lapse of a long time.

The following is the result of experiments:—

Crude oil (just fresh from the mill)	0.91 in acid value
Crude oil refined	Neutral
Refined oil kept in a bottle for a year and half...	Neutral
Crude oil stored for 6 months over summer ...	3.23 in acid value

The physical character of Bean Oil refined by means of alkali is found to have undergone no considerable change from crude oil, only a slight decrease in viscosity being noted.

	Crude oil	Refined oil
Acid value	0.904	Neutral
Viscosity (Engler degree)	482	471
Specific gravity	0.9246	0.9241
Refractive value (15°C by butter refractometer)	77.5	77.8

Refining by means of Sodium Carbonate: The action of sodium carbonate on Bean Oil is slow and it will not affect neutral fat. Neither does the Oil suffer in quality as does from a solution of caustic soda, even by the use of a solution of high concentration, for instance, at 30° Be. Then, the settlings appear somewhat inclined to be flossy, and moreover difficulty seemingly attends on their removal.

Since the rise of temperature affects the quality of the Oil but little, unlike caustic soda, the use of sodium carbonate at between 70 to 80 degrees is advisable.

The low concentration of the solution is apt to generate an emulsion. Therefore, a solution of above 25 degree Be. ought to be used. Then, as small a quantity thereof as possible will answer the purpose best. In point of the flavour of the product, it is found materially the same as when caustic soda solution is used, but it is decidedly inferior in respect of bleaching.

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When a solution of 30° Be. is used to the amount of 2% of crude oil for refining at a temperature between 65°-75°, no emulsion has taken place, the saponified matter readily congealing and settling.

(4) Bleaching by means of Clay.

The colour of Bean Oil, as in all other cases, is also almost proof to the adsorbing power of clay and is hard to bleach. In order to make crude oil of dark brown colour light yellow, about 10% of clay to the weight of the oil at the temperature of 60° is required.

The following gives a table of comparison among Bean Oil, cotton-seed oil, and olive oil:—

	Clay wanted to bleach from dark brown to light yellow	Clay wanted to bleach almost colourless from dark brown
Bean Oil	10%	18%
Cotton-seed Oil	4%	9%
Olive Oil	(light yellow in colour)	5%

The following is a list of quantities of clay required for bleaching Bean Oil of dark brown colour to light yellow:—

Kambara clay	10-12%
Hydro-Silicate (American & German)	12-15%
Florida earth (American)	12-15%
Fuller's earth (British)	15-18%
Decolourizing powder (Granes Entfarbungs-Pulver)	12-15%
Decolourizing powder (Schwarzes Entfarbung's-Pulver) ...	12-15%

Method of Bleaching: Kambara clay should be first heated to 110°-120° and be freed of what moisture it has contained. As to other decolourizers, they should be heated to light red. Any of these decolourizers may be slowly put in the oil, being stirred-up well in the meanwhile. Then, the temperature may be raised to 65 degree, and after 15 minutes' stirring-up, the mixture may be filtered.

When clay is kept in contact with Bean Oil for over 20 minutes, it will impart a bad smell to the oil.

It is true that the bleaching action of clay is intensified as the temperature rises, but when the temperature goes above 60 degree, the flavour of the oil will be seriously affected, and if it rises over 90°, it will give the oil a disagreeable odour.

The decolourizing property of clay and its extent of imparting odour varies proportionally to the acid value of the clay.

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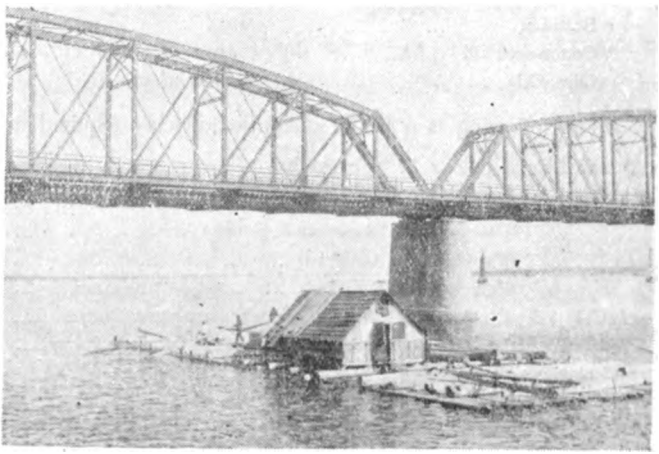
The following table of comparison concerning clay of different kinds will be of some interest :—

	Acid value	Decolourizing property	Extent to which odour is imparted
Kambara clay	Strongest	Strongest	Strongest
Hydrosilicate, B. Krosburg Berlin	Slight	Somewhat strong	Rather strong
Hydrosilicate, E. Krosburg Berlin	Strong	Strong	Strong
Fuller's earth (Bisilial earth, England) ...	Slight	Slight	Slight
Fuller's earth (Bisilial earth, Best, England)	Somewhat strong	Rather stron ;	Rather strong
Hydrosilicate, B. Lintuer, Germany	Strong	Strong	Strong
Hydrosilicate, Refined N. Y.	Strong	Strong	Strong
Fuller's earth (Fine Oil Comm. Co. N. Y.)...	Slight	Rather strong	Rather strong
Fuller's earth (Owl Comm. Co. N. Y.) ...	Rather strong	Weak	Weak

The chief drawback of this method lies in the considerable loss of Bean Oil resulting from the bleaching action.

For the bleaching of Bean Oil, a far larger quantity of clay is required than in the case of other vegetable oils. Correspondingly, the loss amount is not less than 8-15%. This loss is accompanied with the imparting of a disagreeable smell, which cannot be removed by any means.



Rafts on the Yalu.

Therefore, this method is available only when bleaching is the only object in view, and neither the deterioration of flavour nor the taking-on of an offensive smell counts.

(5) Bleaching by means of Oxidation.

As the colour of Bean Oil is unstable to light, so is it to the oxidizing action of heat and air. On this account, bleaching is liable to be attended with chemical changes.

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When Bean Oil is heated slowly up to 130 degree and is kept at that temperature for ten hours, considerable decolourization will be effected, indeed to the extent of its being light yellow in colour and approaching transparency.

The rapid heating of Bean Oil to 180 degree will give like results, only the oil is apt to assume a somewhat dark blue colour. If the oil is stirred up or air is blown in at the same time, the decolourization process is effected fast. Under 100°, the oil will turn to light yellow in from three to five hours; the smell inherent in oil will be wholly taken off, giving instead an odour like that of the rape-seed oil. Heating in a temperature of 110 degree or under for a long time will bring about the same results. Only it is often likely to introduce a tendency to deteriorate. Therefore, a chemical change ought to be prevented by utilizing the action of heat.

A temperature ranging from 110° to 120° is held as the most suitable. At over 150°, a deterioration will be ushered in rapidly. At between 180°-190°, a pungent smell reminding one of acrolein will be imparted. When it rises to 200° or above, the decomposing process will advance.

The viscosity of oil will rise proportionately to the rise of temperature and the length of time for which the heat is applied. A like change in specific gravity will be noted.

Temperature applied	Length of time	Viscosity (20° Engler)	Specific gravity (15.5°)
Crude oil	—	7.37	0.9255
100°	14	9.57	0.9260
"	20	10.09	0.9265
"	28	12.22	0.9270

Refractive value also changes with the temperature (by W3).

Temperature applied	Length of time	Refractive value (Butter refractometer)
Crude oil	—	72.2
100°	7	72.4
"	21	72.8
"	35	73.2

The effect which the action of heat gives iodine value is as follows:—

Crude oil	Iodine value (Wijs method)
	1.321
When heated at 110° for 20 hours	125.0
" " " 120° " 29 "	124.3
" " " 136° " 27 "	100.0

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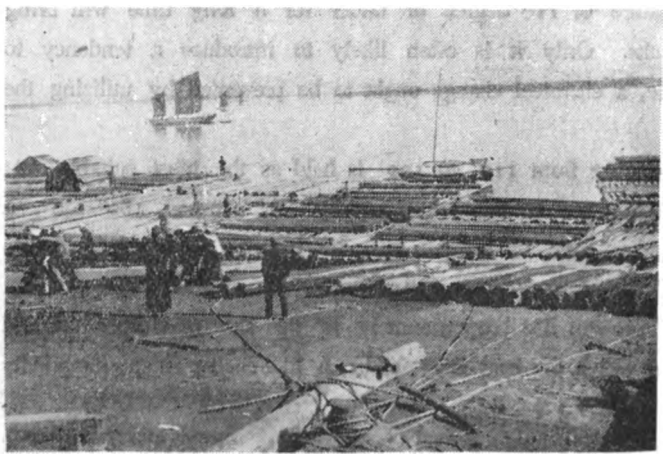
From the above it will be seen that the rise of temperature and the length of time generally decreases the iodine value.

The application of ozonized air will give little effect, as the colour of Bean Oil is not at all sensitive to ozone.

From the above results of experiments, Mr. Uyehata has drawn the following conclusion :—

For refining Bean Oil, the use of alkali (or caustic soda) is recommended. By this method, 6%-9% of precipitations is produced according to the quality of crude oil. Decolourization may indeed be incomplete, but the product will possess an excellent flavour. There will be no free acid. Neither is any change in quality observed. For this reason, the oil is not only suited to table use, but also is highly suitable for export after being refined.



Timber Landing at Antung on the Yalu.

When oyster shell ash or shell ash which has hitherto been used in the manufacture of rape-seed oil is used for refining purposes, more or less chemical action will be caused to the oil, a pungent smell being imparted.

Again, acid earth will cause a larger loss amount from bleaching and is also liable to give a disagreeable smell, and on this account is hardly desirable for no other purpose than bleaching. Refining by means of acids or an acid bleaching method cannot be applied to practice.

A careful perusal of the above discourses by Mr. Nishiyama and Mr. Uyehata will show that they contradict each other in their conclusions. Which should be adopted must be well studied out.

In short, it appears that, according to the intended uses of Bean Oil, the

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question of deciding which refining method should be chosen must be considered, and full consideration must be expended before deciding the choice.

Recently it is reported that a sodium dichromate solution is used for the decolourization of Bean Oil. This is styled the bichromate method.

By means of sodium dichromate and sulphuric acid (in ordinary circumstances, to 1 of sodium dichromate, 2 of sulphuric acid of 66° Be. is used), the colour of Bean Oil is oxidized, thereby the object of decolourization being attained.

After sodium dichromate has become fully reduced, water is to be applied to the amount of about 25%, and then the mixture is to be heated by steam for about half an hour, to be kept still and to get the water separated, and, in order to remove the chromates produced, it is to be washed in water. Occasionally, a solution of caustic soda of 30° Be. is used for washing purposes. But in such case, there is danger of part of the oil getting saponified, and consequently an emulsion, which will render the separation of the water very difficult, is likely to be created. On this account, as little soda as possible should be employed at as low a temperature as possible. Through the washing thus repeated twice, the oil will become almost decolourized. Potasium dichromate, because of its power to get dissolved in water being not so large as sodium salt, is not suited to use for refining purposes. (*Vide* Oil & Colour Trade Journal, 1912 42, 208; and Chemische Revue uber die Fetto und Harz Industrie, 1911, 11, 96).

Sun-drying Wild Cocoons, Antung.

Oil may be extracted by means of a volatile solvent and to this fatty solvent is applied a small quantity of salt water, alkali, or alkaline earth metal. The solvent may be distilled and be eliminated, then the remainder may be left still so as

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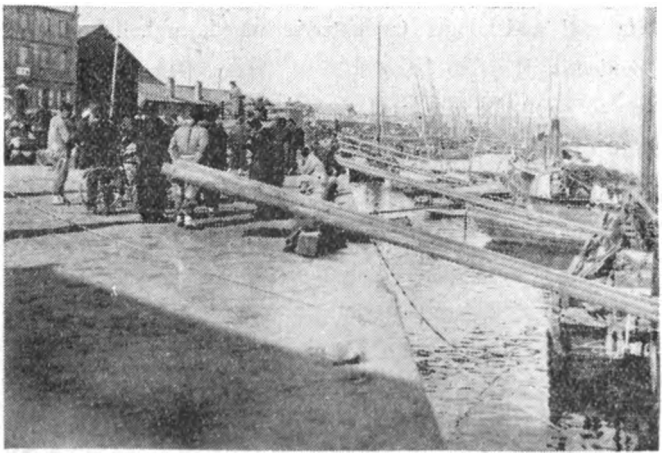
to let the oil layer get separated. This salt solution will preserve the wax and albumen extracted from Bean Oil, only to separate them subsequently.

Therefore, the upper clear portion of the salt solution is good for use fo refining purposes for the second time. (British Patent 1909. No. 5797).

Settlings produced from Bean Oil while refined by means of sulphuric acid.

While Bean Oil is being refined by means of sulphuric acid, the oil so refined is sometimes found enveloped with crystallized settlings of whitish colour. These settlings hinder the combustion of the oil, and when compared with oil freed from these settlings or ordinary oil, it has less combustibility.



Chinese Customs, Antung.

Mr. Brightman (Brightman, J. Soc. Chem. Ind. 1919. 38. 120. T.) has published the results of his investigation about these settlings as follow:—

A small quantity of the above mentioned settlings has been filtered and has been used as the object of experiment.

It has shown an acid reaction. When methyl orange is used as indicator in order to neutralize 10 grammes thereof, 1.1 c.c. of regular caustic potash solution is required. When phenol phthalein is used, 5.8 c.c. is required. Thus its acid value corresponds to 5.39% of free sulphuric acid or 13.3 of free fatty acid (in the form of oleic acid). These same settlings get dissolved to the extent of 64% to petroleum ether, and to the extent of 17% at ordinary temperature.

Since Bean Oil gets dissolved in this solvent, it is evident that no Bean Oil of above 17% exists.

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Again, the presence of free sulphuric acid in the same settlings is proved by means of barium chloride. Moreover, the result of analysis shows that there are contained 8.5% of phosphor and 13% of ash (chiefly ferric oxide).

That the settlings are acid and also that part thereof gets dissolved in petroleum ether suggest that they are mainly composed of dioxi-stearic acid or one of their isomers.

When the settlings dissolved in alcohol is evaporated, a white crystalline matter of 32° in melting point will be obtained. This matter is neutral, which is shown by analysis to contain 0.7% sulphur, being 94.3 in saponified value, 120.5 in iodine value, the melting point of the unsaponified matter being 37.5°. It is acetylized and shows no increase in weight.

The fatty acid obtainable from the settlings is of 25° in melting point, with 298 for neutralization value, 123.4 for iodine value, and 308 for mean molecular weight. It contains no sulphur. This is explained by the fact that the sulphur, which is contained in the settlings in complex forms, may be removed through saponification.

Next, in order to explain that the saponification value of the settlings is smaller than their neutralization value, it is necessary to assume that the two molecules of glyceride, have become condensed and combined with the sulphoned group. Or, in other words such as SO_2 (OCH_2 CHOR, CH_2 OR)$_2$ may, through saponification, become dissolved into the two molecules of glyceride, several molecules of fatty acid, and sulphuric acid.

Then the indices of this fatty acid exactly coincide with those of the fatty acid of Bean Oil.

Next, a synthetic product containing sulphur may be obtained by the condensation of sulphonized fatty acid.

It being plain to require a high temperature for the sulphonation of fatty acids, neither production nor decomposition of such synthetic product can occur easily. Then, this matter gets readily dissolved, when subjected to heat together with acetic unhydride, indicating a departure from the theory of condensation of sulphonized fatty acid. Another like departure is noticed in the high iodine value of the settlings.

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Sulphonation must occur from the double bond, while the iodine value must decrease considerably. These theories are, however, contradicted by fact.

Supposing that the settlings consist of complex sulphonized glyceride, it is clear that the synthetic product contains dioxi stearic acid or other oxy-acid. The matter obtained by purifying and acetylizing the settlings weighs 5.5% heavier and contains no sulphur, showing the dissolution of the product. The saponification value is 232, indicating that of acetylized fatty acid and glyceride; then, the fatty acid obtained from the product may be almost dissolved in petroleum ether. The melting point of the acid dissolved is 27.5 and it is readily acetylized. What has been acetylized has 29° for melting point, 229 for saponification value, and 245 for mean molecular weight.

These figures demonstrate the presence of oxy-fatty acid in the product. Therefore, the settlings are supposed to be sulphonized glyceride.

The cause of their production is not clear, but the following explanation thereof may be hazarded:—

The 1-2 glyceride has become condensed by the temperature raised locally by sulphuric acid.

The above point can scarcely be explained by the determination of glycerine in Bean Oil. But the following table plainly shows that the oil can be acetylized, or in other words, it contains oxy-fatty acid.

For the observation of acetyl value, the method for the determination of the Reichert-Meissl value of the Oil immediately before and after the observation was adopted.

The following table is extracted from p. 9224, Volume 2, Industrial Chemical Review, 1919):—

	1 crude oil	1 acetyllene oil	2 crude oil	2 acetyllene oil
Saponifying value	187.5	196.8	120 9	208.7
Reichert Meissl value ...	1.0	7.85	0.9	7.4
Polenske value...	0.3	0.5	0 3	0.5
	Fatty Acid			
	Before acetyllization	After acetyllization	Before acetyllization	After acetyllization
Melting point	24.0	—	23.5	25.0
Mean molecular weight ...	287.7	—	290.0	324.1
Saponifying value	—	210.9	197.2	223.3
Iodine value	141.5	129.7	141.8	117.6

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IV. Characteristics of Bean Oil.

Bean Oil produced by expression is a brown liquid, giving a peculiar disagreeable smell. When refined, it is light yellow in colour, and although a little odour is still retained, it has a pleasant flavour. Generally it gets dissolved in an organic solvent.

(A) Physical Characteristics.

(1) Specific Gravity.

Bean Oil varies more or less in specific gravity according to the kinds of Beans, the method of manufacture, the freshness and staleness of oil, etc.

Mr. G. Uyehata (in p. 229, Vol. 1, the Central Laboratory Report of the Kwantung Government) puts the scope of variation at 0.9245-0.9255 at 15 degree, whilst Mr. Nishiyama (in p. 665, Vol. 11, Industrial Chemical Review, 1908) places it at 0.924-0.9286 at 15.5 degree.

The data figured out hitherto are as under:—

Temperature	Specific gravity	Observers
15.0°	0.9256	Mr. Tsujimoto (in p. 224, Vol. 7, Industrial Chemical Review, 1904)
15.5°	0.9243	Mr. Nishiyama (in p. 659, Vol. 11, Industrial Chemical Review, 1908)
15.0°	0.9265	Dr. K. Keimatsu (Chem. Zeit, 1911, 839)
15.5°	(1) 0.9276	Mr. Tsujimoto (in p. 161, Japanese Vegetable Oils and Fat)
15.5°	0.9110	Mr. Tanaka (in p. 634, Vol. 22, Industrial Chemical Review, 1919)
15.5°	(2) 0.9265	C. Oettinger and F. Buchta. Z. Angew Chem. 1919, 24. 828-829.
15.5°	(3) 0.9146	
15.5°	(4) 0.9155	
15.5°	(4) 0.9260	H. Matthes and A. Dahle: Arch, Pharm. 1911, 249. 424-435.
15.5°	(2) 0.9265	

(1) denotes oil produced by extraction on the market; (2), crude oil; (3), ordinary oil; and (4). refined oil.

According to the investigation of Mr. G. Uyehata (in p. 260, Vol. 1, the Central Laboratory Report of the Kwantung Government), Bean Oil will increase in specific gravity if heated, this increase being proportionate to the rise of temperature and to the length of time.

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(2) Freezing Point and Melting Point.

Bean Oil, because of its being a mixture between several kinds of fatty acid and glycerine ester, has no fixed freezing point. In ordinary circumstances, if kept long at zero degree or cooled down to 7-8 degrees below zero, it produces a solid mass, freezing at about 17° below zero.

The following gives the data, together with the observers names, so far made public:—

Observers	Freezing point
Keimatsu (Chem. Zeit. 1911. 839)	15-16° below zero
Uyehata (p. 229, Vol. 1, Central Laboratory Report, Kwantung Government)...	10-12° "
C. Oettinger and F. Buchta. Z. Angew, Chem. 1911. 24, 828-829.	8-16° "
H. Matthes and A. Dahle (Arch. Pharm. 1911. 249 424-435) ...	11.5-12° "
Nishiyama (p. 664, Vol. 11, Industrial Chemical Review, 1908) ...	17° "
Tanaka (p. 634, Vol. 22, Industrial Chemical Review, 1919) ...	29° "

Of the above table, the figure given by Mr. Tanaka seems two low. How it is so widely different from the others is not clear.

As to melting point, nothing approaching a constant is obtainable. Dr. K. Keimatsu (in 839, Chem. Zeit., 1911) states that Bean Oil, once frozen, will melt at 7-8° below zero.

(3) Refractive Value.

The refractive value of fat may ordinarily be indicated with two sets of figures, one giving the figures registered on an ordinary refractometer, and the other those denoted on a butter refractometer.

The former ranges between 1.4740 and 1.4760 usually at 20°, whilst, as to the latter, Mr. G. Uyehata (in p. 229, Vol. 1, the Central Laboratory Report, Kwantung Government) gives the scope of variation at 77.0-77.8 at 15°. The refractive value changes regularly if high temperature is applied.

Mr. M. Tsujimoto (in p. 160, Japanese Vegetable Oils & Fat), as a result of observing the refractive value of Bean Oil expressed at the City of Tokushima and also what was extracted chemically and was on the market by means of a butter refractometer, obtained the refractive figures of 75.1 and 76.1.

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The data obtained by means of an ordinary refractometer (like Abbe's) are as under :—

Observers	Refractive value	Temperature
Tsujimoto (p. 224, Vol. 7, Industrial Chemical Review, 1904)	(1) 1.4755	20°
Tsujimoto (p. 161, Japanese Vegetable Oils)	(2) 1.4761	"
Nishiyama (p. 659, Vol. 11, Industrial Chemical Review, 1908)	1.474	"
C. Oettinger and F. Buchta (Z. angew chem. 1911 24, 828-829)	(3) 1.4745 (4) 1.4750 (5) 1.4755	" " "
H. Matthes and A. Dahle (Arch. Pharm 1911 249, 424-435)	1.4680	40°

Of the above table (1) denotes oil expressed at the city of Tokushima, Japan; (2), oil extracted chemically and on the market; (3), crude oil; (4), ordinary oil; and (5), refined oil.

(4) Viscosity.

According to the results obtained by Dr. Keimatsu by the use of Engler's viscometer (Chem. Zeit. 1911. 839), the viscosity of Bean Oil is placed at 8.9-9.0 at 20°, whilst Mr. G. Uychata put down (in p. 229, Vol. 1, the Central Laboratory Report, Kwantung Government), as scope of variation, the time required for the outflow of 200 c. c. at 40 between 446 and 582 seconds.

The following is the table recording the viscosity of Bean Oil by means of Redwood's viscometer (the figures being the length of time wanted for the outflow of 50 c.c.) :—

	Seconds	Temperature
Tsujimoto (in p. 224, Vol. 7, Industrial Chemical Review, 1904)	345	15°
" " "	280	20°
Nishiyama (p. 659, Vol. 11, Industrial Chemical Review, 1908)	205	20°
Tanaka (p. 634, Vol. 22, Industrial Chemical Review, 1910)	200	"

The material used by Mr. Tanaka was put out by the Nisshin Oil Mills, Ltd., Dairen.

(5) Dryness.

According to the experiments conducted by Mr. M. Tsujimoto (in p. 224, Vol. 7, Industrial Chemical Review, 1904), Bean Oil, when put on a piece of glass in a thin coat and subjected to heat at 100°, while exposed to the atmosphere, will begin to gain in viscosity in about two hours, producing a dry thin film in four or five hours.

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Either yemola or linseed oil, when subjected to a similar process, will get perfectly dry in about 1½ hours and cause a hard thin film to appear on the surface.

However, the thin film forming on Bean Oil is the least resistant, and may be easily torn up with the tip of a finger. But, it tends to grow harder as days go by.

M. Y. Nishiyama (in p. 665, Vol. 11, Industrial Chemical Review, 1908) says that he manufactured pulverized lead according to the Livache system, and put it in a glass vessel, then, he let Bean Oil fall on it drop by drop, leaving it still. The increase in weight was noted as under:—

After 18 hours	1.90%
„ 66 „	8.01%
„ 90 „	9.12%
„ 114 „	9.66%

Thus, Bean Oil is shown to possess far less drying property than either yemola or linseed oil, although comparatively high among other kinds. Therefore, Bean Oil may be classed as semi-drying oil.

Then, speaking from a view point of its ingredients (vide. the chapter of "Ingredients"), it differs from drying oils in that it contains only a very small quantity of linolenic acid. It also differs from non-drying oils in point of containing a large quantity of linolic acid. So, Bean Oil has every reason to be treated as semi-drying oil.

B. Chemical Characteristics.

(1) Saponifying Value.

Mr. G. Uyehata (in p. 229, Vol. 1, Central Labouratory Report, Kwantung Government) gives, as a result of his investigations, the scope of the saponifying value of Bean Oil to be 198-202. Mr. M. Tsujimoto, however, comments upon this as somewhat too high. For the part of the author (of the present article), 190-195 may be accepted as approximately correct.

The saponifying values so far on record are as under:—

Bean Oil	Iodine value	Method of observing	Observers
Put out in Tokushima Prefecture	130.0	Hubl method	Tsujimoto (p. 224, Vol 7, Industrial Chemical Review, 1904)
„	131.50	Wijs method	„ „
Produced by Chemical extraction	136 04	„	Tsujimoto (p. 161, Japanese Vegetable Oils)
„	134.4	„	Nishiyama (p. 650, Vol. 11, Industrial Chemical Review, 1908)
Produced by Nisshin Oil Mills, Dairen	137.22	„	Tanaka (p. 634, Vol. 22, Industrial Chemical Review, 1919)
Crude oil	135.1	Unknown	C. Oettinger & Buchta (Z. angew. chem, 1911, 24, 829-828)
Ordinary oil	132.0	„	
Refined oil	135.0	„	
Crude oil	132 6	Hubl method	H. Matthes & Dahle Arch. Pharm. 1911. 249, 424)
Refined oil	131.3	„	

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Matthes & Dahle (Arch. Pharm. 1911, 249; 424-435) used the same samples of Bean Oil employed for the observation of the iodine value above mentioned, leaving them in the following four conditions :—

(1) In moist atmosphere
(2) In dry atmosphere
(3) In acid
(4) In moist acid

On the lapse of six months, the iodine values of the same sample were observed and the following conclusion was drawn :—

(1) Acid, either singly or under pressure, or in moisture, does not lower the iodine value of Bean Oil.

(2) Moist atmosphere lowers the iodine value of Bean Oil. For instance, the figures for crude oil and refined oil came down from 132.6 and 131.3 to 105.4 and 122.5 respectively.

Mr. G. Uyehata (in p. 261, Vol 1, Central Laboratory Report, Kwantung Government) reports that Bean Oil, when heated, is lowered in iodine value and that the higher rises the temperature and the longer lasts the time of heating, the lower sinks the iodine value.

(3) Reichert Meissl Value.

The Reichert Meissl values, as observed so far, are as under :—

	Reichert Meissl value	Observers
	0.55	Nishiyama (p. 650, Vol. 11, Industrial Chemical Review)
Crude oil	0.56	C. Oettinger and F. Buchta (Z. angew. chem. 1911. 24, 828-829)
Ordinary oil	0.50	
Refined oil	0.45	
Crude oil	0.75	H. Matthes & A. Dahle (Arch. Pharm. 1911. 249, 424-415.
Refined oil	0 75	

(4) Hahnel Value.

As to Hahnel Value, only such as have already been published are given below :—

Bean Oil	Hahnel value	Observers
Produced at city of Tokushima	95.7	Tsujimoto (p. 224, Vol. 7, Industrial Chemical Review, 1904)
———	95 2	Nishiyama (p. 650, Vol. 11, Indurtrial Chemical Review, 1908)
Haar milch, Germany	94.2	Keimatsu (Chem. Zeit. 1911. 839)
Crude oil	95.8	C. Oettinger and F. Buchta (Z. angew. chem. 1911. 24. 828-829)
Ordinary oil	90.0	
Refined oil	95.9	

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(5) Acid Value.

Acid value varies according to the nature of oil, method of manufacture, etc. However, generally speaking, crude oil has a higher acid value than refined oil. So does stale oil, compared with fresh oil. It is because free acid shows an increase from spontaneous oxidization, hydrolysis, etc.

The following is a table of data determined hitherto :—

Bean Oil	Acid value	Surveyors
Put out in Tokushima	7.59	Tsujimoto (p. 224, Vol. 7, Industrial Chemical Review, 1904)
Put out by chemical extraction	0.75	Tsujimoto (p. 161, Japanese Vegetable oils)
———	0.55	Nishiyama (p. 659, Vol 1, Industrial Chemical Review, 1908)
Crude oil	5.2	C. Oettinger and F. Buchta (Z. anger. chem. 1911. 24. 828-829)
Ordinary oil	0.41	
Refined oil	0.00	
Crude oil	1.71	H. Matthes and A. Dahle (Arch.
Refined oil	0.57	1911. 249. 424-435)

With ordinary Bean Oil, the acid value usually ranges from 0.3 to 0.6, in a few cases rising over 5.

H. Matthes & A. Dahle (Arch. Pharm. 1911, 249 424-435), from the result of their investigations, have reached the conclusion that the moisture in the air increases the acid value of Bean oil.

Mr. Y. Nishiyama (p. 762, Vol. 11, Industrial Chemical Review, 1908) has noted that exposure to the sun increases the acid value of Bean Oil. When Bean Oil was exposed to the direct rays of the sun for a long duration, he observed the following changes in acid value :—

	Acid value
Original oil	0.55
After exposure for 30 days	1.08
" " " 90 "	4.63

The same expert, with the object of testing whether or not the Bean Cake present in Bean Oil increases the acid value, he mixed about 20 % of Bean Cake with Bean Oil and left the mixture together at an ordinary temperature for four or five days. But the acid value increased from 0.55 to only 1.11. In other words, he learned that the acid value in Bean Oil is only slightly affected by Bean Cake.

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(6) Other Polenske Values.

According to the observations of Matthes and Dahle (Arch. Pharm. 1911, 249, 424-435), the Polenske value is 1.08 in crude oil, and 0.78 in refined oil.

Maumene Value: The data so far determined are as under:—

Maumene value	
96	Nishiyama
59	Negri & Fabris
102-116	Koreutscheuski & Zimmermann
82-84	Mister
87-88	Oettinger & Buchta

Elaidin Test: Mr. M. Tsujimoto (p. 224, Vol. 7, Industrial Chemical Review, 1904) conducted the Elaidin test at 20° on the Archbach system. In two hours' time, most of the oil turned to a liquid of red colour, with a little precipitate of orange colour. On the lapse of twenty four hours, the same state was preserved.

Mr. Y. Nishiyama (p. 665, Vol. 11, Industrial Chemical Review, 1908) mixed nitric acid and quicksilver with Bean Oil. Then, the mixture was well shaken up and was left standing still for twenty minutes, showing no change. Only, it thickened somewhat after a few days.

Bromine test: Production of hexa-bromide insoluble in ether.

When Bean Oil containing linolenic acid and glyceride is acted upon with bromine, a hexa-bromide is formed, insoluble in ether.

Mr. Y. Nishiyama (p. 666, Vol. 11, Industrial Chemical Review, 1908) conducted a bromine test according to the Hahnel and Mitchell systems, obtaining bromide of about 1.1% to the original Oil. This bromide is found soluble in alcohol, having 151° for melting point.

Reaction of bromine on temperature. Mr. Nishiyama (p. 666, Vol. 11, Industrial Chemical Review, 1908) experimented upon the reaction of bromine on the temperature of Bean Oil in accordance with the Haynel and Mitchell systems, and reported that the temperature rose to 23.5°.

(V) Composition.

Bean Oil is composed principally of glycerine ester of fatty acids of various kinds, saturated and non-saturated, containing in addition a small quantity of free fatty acid and non-saponified matter, etc.

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According to Dr. Reigel (Pharm. Zeit. 1910, 55,428) contains lecitin of 0.15% to Bean Oil.

Unsaponifiable matter: Its quantity.

As to the unsaponifiable matter of Bean Oil, there appears to be a wide range of difference according to the places of origin of Beans, from which Bean Oil has been made, the method of manufacture of Bean Oil, etc.

Dr. K. Keimatsu (Chem. Zeit. 1911, 249, 436-444) puts it at about 2%; Messrs. Ubelode and Goldschmidt place it at 0.22%; Mr. Y. Nishiyama (p. 670, Vol. 11, Industrial Chemical Review, 1908) rates it at 0.64%; Matthes and Dahle (Arch. Pharm. 1911, 249, 436-444) put it at 0.7%; whilst Mr. T. Okada (in p. 65, Vol. 1, the S. M. R. Co. General Laboratory Report) says that he has obtained 1%.

Composition of Unsaponifiable matter: Matthes and Dahle (Arch. Pharm. 1911, 249,336-344) have mixed crude unsaponifiable matter with petroleum ether, allowing the mixture to cool down, separating itself into 55% of crystallized solid matter and 45% of liquid matter. The solid matter has been acetylized and brominated in an ether solution, the result being that two kinds of bromide have been obtained, one soluble in ether and the other not soluble.

What is insoluble in ether is tetrabromide stigmasterol having 205-206° for melting point. The stigmasterol obtainable from the bromide has the melting point of 169° and is also possessed of two double bonds. It is strongly dextro-rotatory and is identical with the stigmasterol obtained from Carabar Beans by Windaus and Hauth (Abstr. 1907, 1,128). Its quantity amounts to about 24% of the unsaponifiable solid matter.

Next, what is soluble in ether has been put in an alcoholic solution, and water has been applied slowly, to let the crystal be crystallized out. Then, dibromide phytesterol having 125° for melting point has been got. This has been reduced and been subjected to hydrolysis, phytesterol of 139° in melting point being had. This is lavo-rotatory and is possessed of one double bond. In quantity, it is 97% of the unsaponifiable solid matter.

As to the liquid matter, its iodine value is 124.4. It gives a colour reaction of phytesterol, and has the same empirical formula as the phytesterol above mentioned. When treated with dikitonin in methyl alcohol, part there of has liberated a crystalline

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addition product, but it is said that the separation of the different ingredients is some-what difficult.

The unsaponifiable matter obtained by Dr. K. Keimatsu (Chem. Zeit. 1911, 35, 839-840) is a crystalline having a snow white lustre. It is a phytesterol of 136°-137° in melting point, not containing stigmasterol.

Mr. Y. Nishiyama (p. 749, Vol. 11, Industrial Chemical Review, 1908) has crystallized a few times over the unsaponifiable matter of Bean oil by means of alcohol, obtaining a rhomboid or haxagonal crystal having 132° for melting point. From its peculiar crystallization, it has been inferred to be phytesterol, and acetic ester has been made, having 126° for melting point. This coincides with the melting point of acetic phytesterol, confirming the theory that it is phytesterol.

Summing up the results of investigations of these experts, it seems established that the unsaponifiable matter of Bean Oil consists of phytesterol. However, as to the presence of stigmasterol, opinions vary according to the specialists, and the question cannot be decided either way without further investigations.

Fatty Acid:

Matthes and Dahle (Arch. Pharm. 1911. 249, 424-435) have found by investigation that Bean Oil contains 94-95% of fatty acid (in the form of neutralized glycerine ester). This fatty acid assumes a liquid form in summer, but crystallizes out a solid acid under a temperature below 20°.

According to Mr. Y. Nishiyama, the fatty acid of Bean Oil turns to a solid mass when below 20°; between 20° and 26°, it becomes liquid in part; and once above 26° it becomes wholly liquid.

The indices of Fatty acid of Bean Oil are as under:—

	Nishiyama	Keimatsu	Morawske & Stingl	D. Negri & Fabris	Schukoff
Sprecific gravity	30° 0.9006	—	—	—	—
Melting point	26°	23°-24°	28°	27°-29°	—
Neutralization point	200 9	—	—	—	—
Mean molecular weight	279 25	—	—	—	—
Iodine value	140.1	—	115.2	122	—
Refractive value...	—	—	—	—	—
Iodine value of liquid acid	146.3	—	—	—	—
Freezing point	22.5°	16°-17°	25°	23°-25°	22°

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	Lane	Oettinger and Buchta	Meister
Specific gravity	—	—	—
Melting point	—	26°	26°-28°
Neutralization point	—	—	—
Mean molecular weight ...	—	—	—
Iodine value	—	—	130.4-131.2
Refractive value	—	27.5° 1.465	—
Iodine value of liquid acid ...	131	—	—
Freezing point	—	23°	23°-24°

The following is quoted from p. 171, Japanese Vegetable Oils by Mr. M. Tsujimoto :—

The fatty acid of Bean Oil, from its Reichert Meissl value being insignificant, has only a very small amount of volatile or soluble fatty acid, and is inferred to consist chiefly of insoluble fatty acid.

The mixed fatty acid of Bean Oil readily dissolves in ether, petroleum ether, chloroform, and alcohol, and from its high iodine value, the mixed fatty acid may be inferred to consist mainly of unsaturated fatty acid.

Mr. Y. Nishiyama (p. 752, Vol. 11, Industrial Chemical Review, 1908) describes the fatty acid of Bean Oil to be composed of the following :—

Unsaturated fatty acid	93.6%
Saturated fatty acid	6.4%

Matthes and Dahle (Arch. Pharm. 1911. 249, 425-436) report as under :—

Mixed fatty acid of Bean Oil :

94-95% of Bean Oil in the form of glycerine ester composed of about 15% saturated fatty acid ester and about 80% of unsaturated fatty acid ester.

The unsaturated fatty acid is said to be composed of the following :—

Oleic acid...	70%
Linolic acid	24%
Linolenic acid	6%

Dr. K. Keimatsu (Chem. Zeit. 1911, 35, 839-840) observes that the glycerine ester of saturated fatty acid takes up about 12% of Bean Oil, whilst, as to the unsaturated fatty acid ester, it is about 80%, as reported by Matthes and Dahle, as referred to above.

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Saturated fatty acid: Saturated fatty acid obtained from Bean Oil is a white crystal body and dissolves alike in ether and chloroform. Also in ordinary temperature, it gets dissolved in alcohol of about 100 times its own quantity.

The indices figured out by Mr. Y. Nishiyama (in p. 759, Vol. 11, Chemical Industrial Review, 1908) are as under:—

Melting point...	48°
Freezing point	45°
Neutralization value	215.5
Mean molecular weight...	255.7°

The same expert then goes on to say that the saturated fatty acid consists chiefly of Palmitic acid, and although a trace of fatty acid of high grade has been suspected, the same cannot be definitely established.

Dr. K. Keimatsu (in p. 71, Vol. 1, the S. M. R. Co. General Laboratory Report) avers that it is proper that, in addition to Palmitic acid, the presence of stearic acid, too, should be accepted.

Unsaturated Fatty Acid:

The unsaturated fatty acid of Bean Oil is a liquid of yellowish brown under ordinary temperature and has a peculiar odour. Even if cooled down to zero egree, no solid matter is crystallized out. It dissolves in an ordinary organic solvent such as alcohol, ether, petroleum ether, chloroform, and benjine.

Mr. Y. Nishiyama (in p. 753, Vol. 11, Industrial Chemical Review, 1908) gives the indices of his own determination as under:—

Specific gravity (15.5°)	0.915°
Neutralization value	203.6
Mean molecular weight	275.5
Iodine value	146.2
Refractive value	1.448

The same specialist (in p. 747, Vol. 11, Industrial Chemical Review, 1908) has obtained the unsaturated fatty acid and has brominated it according to the Hahnel and the Mitchell method, obtaining thereby 0.82% of hexa-bromide. Next, the bromide has been crystallized out of the petroleum ether according to Farnsteiner method, obtaining thereby 15.21% of tetra bromide.

In order to further look into the characteristics of these bromides, about 20 grammes of unsaturated acid has been dissolved in petroleum ether, then it has

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been cooled to zero degree, and next been brominated. The crystallized matter so produced has been left standing and then filtered. Then petroleum ether has been mixed, and heated in a refrax condenser. After being filtered through the hot water funnel, the precipitate left has been heated twice over, together with ether. Then, it has been filtered again and heated once more, with a liberal amount of ether (petroleum ether). Next, the liquid has been left alone to get crystallized.

Bromide Insoluble in Petroleum Ether: This bromide has been caused to crystallize by means of a liberal quantity of warm ether, and then to crystallize three times over. It has then been found that its melting point has reached 178° and its freezing point, 172°. It has been learned to be hexa-bromide of linolenic acid.

Bromide Soluble in Warm Petroleum Ether: When caused to crystallize after being filtered, the bromide has assumed a stellate needle crystal clustered together. This has been caused to crystallize further three times by means of petroleum ether, and again twice over through glacial acetic acid. Then the melting point has been found to be 113° and the freezing point 109°, proving it to be tetra-bromide of linolic acid.

Next, the unsaturated fatty acid has been oxidized on the Hazra method. This product has been treated with a small quantity of ether, and the ether solution has been caused to evaporate slowly. Then a lustrous white crystal has been obtained, having 105° for melting point.

When recrystallized repeatedly by means of alcohol, it has had its melting point raised to 109°. Mr. Nishiyama has hazarded that it is a dioxy-Palmitic acid [$C_{16}H_{30}(OH)_2O_2$]. The residue has then been treated with much ether, and this solution has become evaporated, and a crystal of 124° in melting point has been obtained. The repetition of crystallizing processes has not raised the melting point. Mr. Y. Nishiyama has put this down as an entietic crystal between dioxy-Palmitic acid and dioxy stearic acid ($C_{16}H_{32}O_4 + C_{18}H_{36}O_4$). The same expert has obtained sativic acid (of 172° in melting point). Moreover, from the portion of the oxide products soluble in water, what is supposed to be linucic acid has been detected.

Mr. Nishiyama, as a result of the above investigations, has concluded that the unsaturated fatty acid of Bean Oil consists of oleic acid, hypogene acid,

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linolic acid, and linolenic acid, and that, although in what quantity they are present is not clear, much unsaturated fatty acid of high grade must be contained besides oleic and hypogene acids.

Dr. K. Keimatsu (in p. 77, Vol. 1, the S. M. R. Co. General Laboratory Report) has reported that the unsaturated fatty acid of Bean Oil consists of about 55% of isolinolic acid and 20% each of linolic and oleic acids, and that the presence of linolenic acid cannot be confirmed.

According to the report of Matthes and Dahle (Arch. Pharm. 1911, 249, 425-436), the ingredients of the unsaturated fatty acid of Bean Oil are as follow:—

Linolenic acid	6%
Linolic acid	24%
Oleic acid	70%

Mr. M. Tsujimoto (in p. 169, Japanese Vegetable Oils) has oxidized 30 grammes of fatty acid of Bean Oil produced at the city of Tokushima on the Harza method. The product has been treated with petroleum ether, and after the saturated and unoxidized acids have been removed, it has been treated with ether of 2500 c.c. Ether has then been taken off the soluble part, the remainder having then been crystallized by means of 97% of alcohol. After subjecting it to crystallizing process three times over, a crystal in hexagonal plate has been obtained, having 132° for melting point and 120°-122° for freezing point. Even what has been crystallized out from the mother liquor, its melting point and freezing point are 131° and 120° respectively. From this it has been learned to be dioxy-stearic acid, but no melted crystal, as obtained by Mr. Y. Nishiyama, has been procured. Therefore, there still remains doubt as to the presence of hypogene acid.

Next, Mr. Tsujimoto has caused the part insoluble in ether to crystallize by means of hot water. The sativic acid, that has been cryitallized out, has been found to be 156°-157° in melting point, as against the standard melting point of 174° for sativic acid. Neither does it agree with the result of investigation by Mr. Nishiyama.

On this account, Mr. Tsujimoto has presumed the original unsaturated acid to be isolinolic acid, an isomer of linolic acid.

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The same expert has also detected linucic acid from the soluble part of the oxidized product, but the presence of isolinucic acid is not quite clear, according to this report.

(To be concluded.)

MANCHURIA ENLIGHTENING SOCIETY.

Whose Organ the "Light of Manchuria" is

What actuates us in our endeavours to open up Manchuria and Mongolia lies in realizing our ultimate ideal in the enlightenment and development of Manchuria and Mongolia. It will not do only to develop the natural and industrial resources, but the ethical and intellectual culture of the inhabitants must also be carefully husbanded and nourished, so that both mind and matter may be developed in harmony.

The Manchuria Enlightening Society raised its first cry in order to fill a sorely felt need. Its primary mission is to investigate and propagate the truths of the development of Manchuria and Mongolia. We shall studiously refrain from misleading the public by disseminating inaccurate or exaggerated reports, but shall steadfastly adhere to the truth or facts only.

It is urgently important that the truths regarding Manchuria and Mongolia should be made known clearly not only to Japan and China, but also to Europe and America. On this account, the establishment of the Manchuria Enlightening Society is bound to have a serious significance of international character.

If happily, through the establishment and activity of this Society, the truths of the development of Manchuria and Mongolia should become topics of world wide interest, it would not be only an honour to those now actively engaged in developing these regions, but also a matter of congratulation to the world at argle.

We might be permitted to add that the ultimate ideal and desire of this Society are to serve as the herald of all enlightening movements in future, thereby opening a new chapter in the annals of the world's civilization.

What is the Society Like.

a) Office.—The office of the Society is in the Municipal Office Building on Central Circle in the city of Dairen.

b) Society's Work.—The works of the Society include the following:—

1. Publication of the organ of the Society, The "Light of Manchuria."

2. Supply of general information through the Society and by other means, giving the results of such investigations and researches as may be conducted in the interest of the development of natural, industrial, and other resources in Manchuria, Mongolia, and Eastern Siberia.

3. To act as guide to intending investors in general in all kinds of enterprises in Manchuria, etc., and also to undertake any special investigation or research on application by promoters of all kinds.

4. To offer facility to travellers on inspecting visits to Manchuria, Mongolia, Siberia, Chosen (Korea), China, etc., to the end of importing accurate information and rendering their observations as close to truth as possible.

5. To use all kinds of means in order to

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propagate the true conditions obtaining in Manchuria, etc., and further to carry on the propaganda work for these regions through the medium of lecture meetings, exhibitions, etc.

6. To compile, publish, sell, and distribute books, pamphlets, etc., bearing on Manchuria and Eastern Siberia.

7. To carry on other works necessary for disseminating information on Manchuria, etc., and also for fostering economic enterprises therein.

c) In carrying on the above work, the Society is divided into the following :—

Secretariate,
Research Department,
Publication Department,
Intelligence Department, and
Accounting Department.

d) Any one wishing to join the Society is requested to send in a written application, giving the name and address, accompanied with the membership fee for not less than three months paid in advance.

e) The membership fee, entitling the member to a copy of the monthly organ, costs 50 sen (½ yen) per month and ¥6 per annum.

Remittances.

All remittances to this Society may be made most conveniently and safely to Transfer Savings No. 2850, Dairen. No receipts for the same will be issued, but instead the Society's monthly organ will be sent.

Officials.

Baron S. Goto (Mayor of Tokyo), President.

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Mr. Y. Aioi (Chairman, Chamber of Commerce, Dairen), Vice-Chairman;

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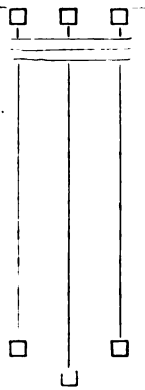

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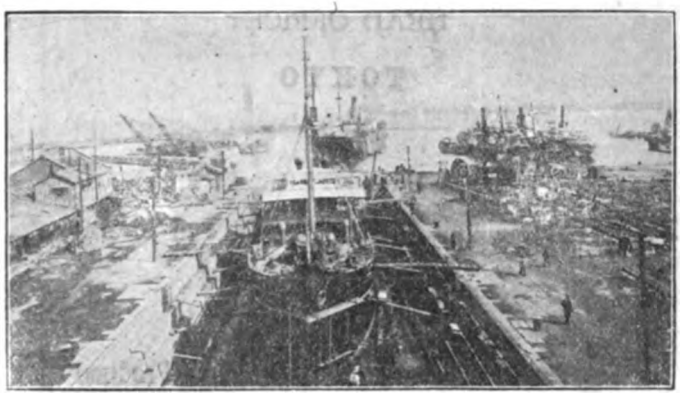

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THE MONTHLY ORGAN OF
THE MANCHURIA ENLIGHTENING SOCIETY.

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MANCHURIA ENLIGHTENING SOCIETY (WHOSE ORGAN THE "LIGHT OF MANCHURIA" IS) . 48-49

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New Year Poem Party at Court.

At the Imperial Court, Tokyo, a New Year Poem Party is held every year in the month of January. It is of course strictly a genuine Janpanese function handed down from time immemorial. All Japanese subjects of poetical inclination are invited to present their efforts on the theme previously announced, and such as are pronounced the best are selected for the Imperial perusal and the subsequent publication. Customarily, T. I. M. the Emperor and the Empress with Princes and Princesses of the Blood take part in the event.

This year's theme is "New Year's Sun Gilding the Waves."

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THE

LIGHT OF MANCHURIA

New Year's Sun Gilding the Waves.

The ripples of waves are in rythms heard,
Peace's message from the yonder shores bringing,
So sweet, soothing, and exhilarating,
Scales of vague darkness are falling.
At the approach of the New Year's Dawn and,
O'er the dim horizon where sea kisses skies,
A flood of light heralds the brilliant morn;
Anon, its radiance everything dyes,
Scintillating as the surges rise and fall,
E'en in the Land, where, the mystic legend says,
The Goddess opened the Portal of light,
It alike on both he-and she-waves plays.
On the silvery beach stands a rugged pine
Like a veteran stemming the foemen's tide,
Towering, its leaves rustling in the wind,
In cool defiance of tempest and Time.
Storms may at times rage, raising billows high,
Still, the nation's banner will e'er glitter,
Unsullied, unfaded, and unbroken,
In First Morn's Sun through ages without number.

A hurried translation of the *nagauta* (Japanese opera song) composed specially for the New Year by Mr. C. Kido, of Dairen, to whom an apology is due for the bad mutilation of the original.

Ed. *M. D. N.*

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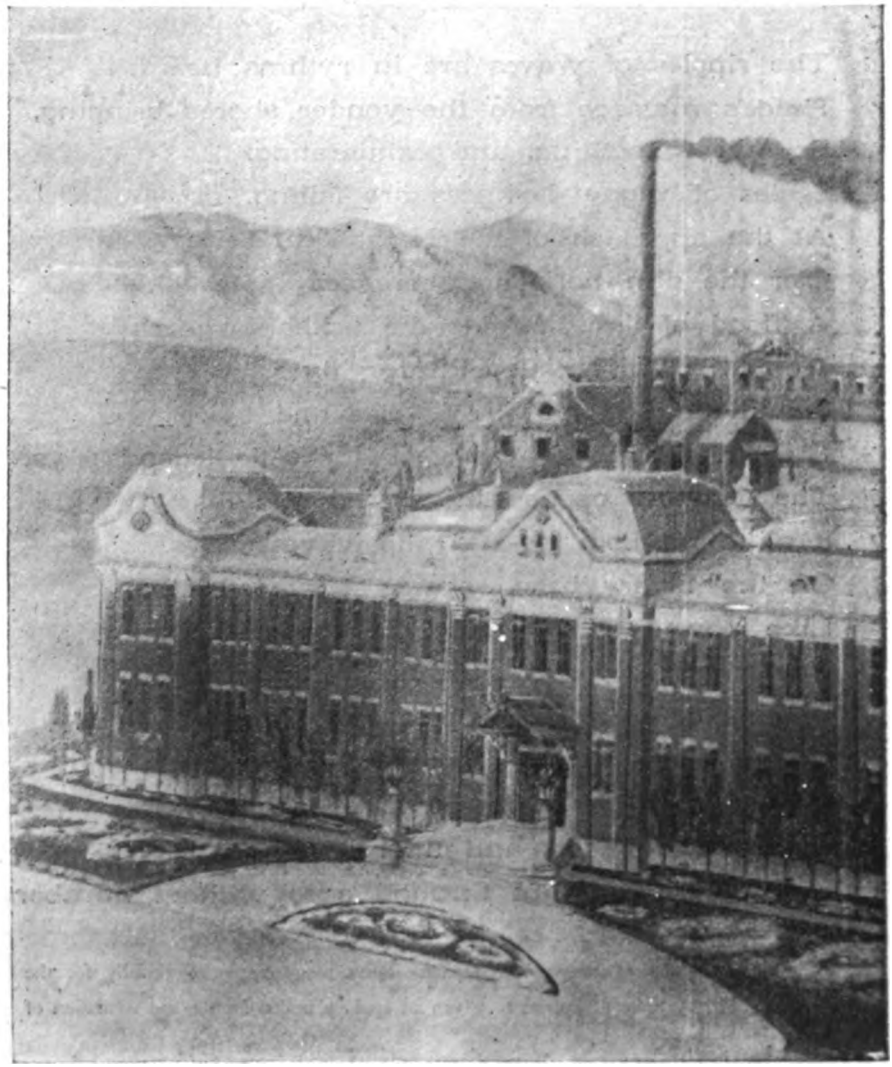
CENTRAL LABORATORY OF S. M. R. Co.

I. Its History.

To develop the rich natural resources of Manchuria and to elucidate the uses of industrial raw materials after a series of experiments and study may be accepted



CENTRAL LABORATORY

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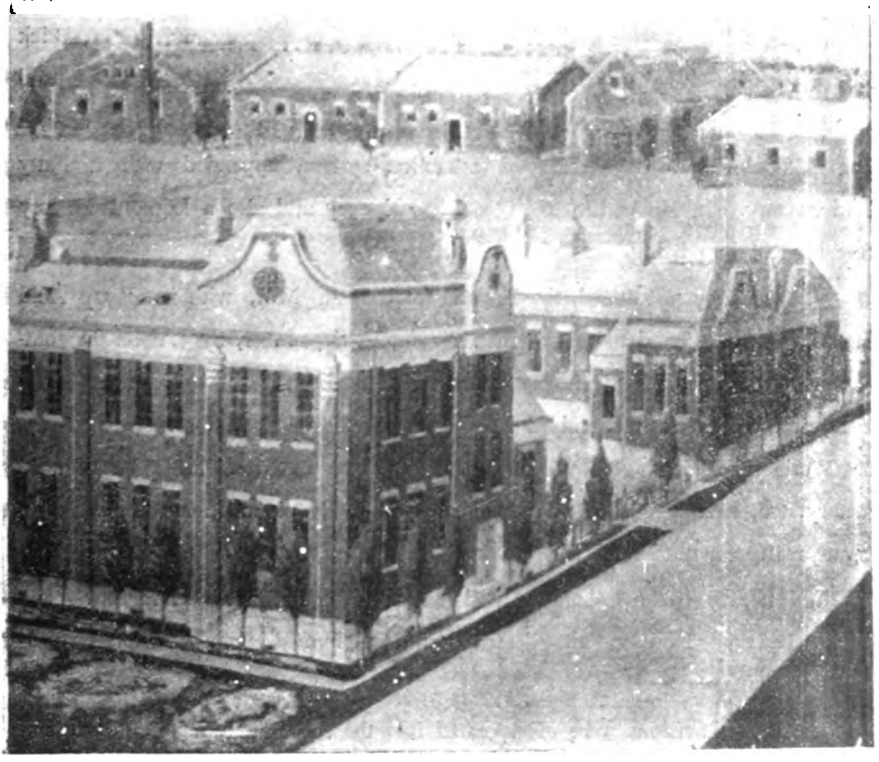
as a matter of practical importance to the public at large, correlatively with the conduct of physical and chemical examinations concerning public hygiene.

The Central Laboratory has been founded and equipped specially by the South Manchuria Railway Company to carry out the above mentioned object. Whilst scientific researches are prosecuted on the volition of the Laboratory, analytical



(PRESENT PREMISES).

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testing, estimations, etc., are undertaken on application from the South Manchuria Railway Company and the public to the end of serving the interests of society at large.

The Central Laboratory was originally established by the Government General of Kwantung in July, 1908, and was taken over by the Railway Company in May, 1910. Its organization was then resolved into the eight divisions of Analytical Chemistry, Applied Chemistry, Textile & Dyeing & Pottery Industry, Ferment Industry, Sanitary Chemistry, Electrical Chemistry, and Detail. A reservation was made that, for any enterprise promising to be raised to a commercially workable basis, an experimental workshop might be founded.

Under this category falls the Tussah Filature established in May, 1910, to begin with, followed with a Earthen Ware & Porcelain Factory and a Fire Brick Kiln. By March, 1914, the Sorghum Alcohol Distillery had been finished, and simultaneously a Dyeing & Weaving Works was opened to operation. Besides, a Bean Mill was founded on chemical extraction system, appended with a Fatty Acid Factory. In November, 1917, a Glass Factory and also a Lignoid Factory were brought into being.

Of the above mentioned, the Experimental Bean Mill, with its Fatty Acid Factory, was transferred to private management in September, 1915, upon the completion of the series of experiments, for which it had been established. The Textile & Dyeing Works was reorganized into a Textile Division on October 10, 1917, the Works itself having been transferred to private management. The Lignoid Factory, too, having finished the experiments originally planned, was transferred to private management.

In June, 1920, the Laboratory underwent another radical reorganization. The Pottery Industry Division was detached and was formed into a Ceramic Experimental Institute.

The other Divisions were incorporated into the two new Divisions of the Examination and the Research. The Distillery and the Filature were both shut down,

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as they had finished the experiments mapped out for them. Attention is to be concentrated henceforth upon the prosecution of investigations on purely scientific lines.

Again, in rendering services regarding analytical testing and estimations, the interests of the general public, but not those of the Railway Company, are to claim precedence, the primary aim of the Laboratory consisting in contributing to the improvement and progress of industry and public sanitation in Manchuria.

Central Laboratory (old premises).

Among the industries built upon the results of investigations by the Laboratory may be enumerated the manufacture of Hardened oil, Salvarsan, Calcium Lactate, Potassium Salts, Starch, Improved "Koji" for Sorghum Alcohol, Permutite Filter, etc.

Moreover, there are six Reports in Japanese and one in German published by the Laboratory.

Furthermore, the Laboratory compiles a Table of Analytical testings of Manchurian Products, subject to additions and alterations as the number of such analytical testings increase. Already, the sixth edition of the above table has been published.

Table of Testings and Estimations.

The following is a table of sundry testings and estimations conducted on application from different sources since 1918:—

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	S. M. R. Co.	Kwantung Government	General Public	Total
1912	1,607	1,498	921	4,026
1913	1,519	1,064	635	3,218
1914	1,847	1,464	747	4,058
1915	1,516	949	796	3,261
1916	2,312	775	1,433	4,520
1917	3,892	839	1,686	6,417
1918	5,318	899	1,268	7,515
1919	4,965	896	1,370	7,231
1920	4,356	857	1,669	6,882

Examination Division.

The Experimental Division takes up all kinds of analytical testings and estimations, and is also engaged in the investigation of sundry raw materials contributing to the study of different experimental methods and the opening up of the indigenous industry.

The following are the chief matters for testing and examination on application at the hand of the Examination Division :—

A) Chemical examination of drugs and pharmaceutical products.

Metallurgical Laboratory (of Examination Division).

The serviceableness of drugs is tested mainly on the lines laid down by the Japanese Pharmacopoeia in accordance with the Kwantung Government Ordinances concerned.

Further, the examination of the purchases made by the South Manchuria Railway Company, and also of chemical substances on application by the general public is undertaken.

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B) Hygienic examination of food-stuffs and general beverages.

Food-stuffs and beverages supplied to the public are subjected to hygienic examinations several times annually in response to the application of the Kwantung Government and the Police Officers under its jurisdiction.

Also, the hygienic fitness of general objects is tested on application by the public.

C) Examination of quality of water.

A periodical examination of the water of the waterworks at about ninety points in seventeen cities under the jurisdiction of the Kwantung Government or the South Manchuria Railway Company or served by the Yingkou Waterworks & Electricity Co. is held.

Again, an examination of the water of a well and a mineral spring is undertaken at any time as applied for.

D) Examination of cement and pozzuolana.

For the examination of cement and pozzuolana, a testing room is provided separately, and an examination is executed herein according to the existing regulations in agreement with applications by the Kwantung Government, the South Manchuria Railway Company, and the general public.

Food and Drink Examining Room (of Examination Division).

E) Examination of oils and fatty matters.

With regard to mineral oils, vegetable oils, and animal oils, the fitness of any of these oils is examined in terms of the regulations governing the testing of quality of lubricating oils of the South Manchuria Railway Company.

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Next, on application by the public, volatile oils, oils and fatty matters, paints, varnishes, putties, etc., are tested in respect of any particular properties thereof as requested.

F) Examination of minerals.

Electro-Chemical Laboratory (of Research Division).

On application by the public, the qualitative, quantitative, and electrical analyses of minerals, alloys, etc., are conducted, in addition to the examination of quality and estimations.

G) Examination of industrial materials and agricultural products.

Analytical examination and estimations are made on application from the public with regard to coal, cement, stone, pottery clay, manure, cattle-feed, cereals and other agricultural products and industrial materials and products.

Moreover this Division is constantly engaged in the study of the best methods of analytical examination with a view to their improvement.

Concerning the methods of examination of the different articles above mentioned, it may be allowed that there is still room left for improvement.

Especially, vegetable oils and cereals constitute the staple products of Manchuria, and they have a great variety of kinds. It is deemed a matter of urgent importance to unify their quality for comparative estimation so as to determine their commercial values, and investigations are being carried on on these lines.

Research Division.

The Research Division undertakes to conduct all sorts of phyisical and chemical study and investigations calculated to contribute to industrial developments. It also

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aims at realizing a systematic management of indigenous industries by a happy blending of unifying the scientific and applied treatments. All applications having the above aims in view are accepted.

The scope of study and investigation of this Division is quite extensive, but in the present situation of Manchuria, the chief subjects of investigations may be enumerated under, with the reservation that such as cannot be conducted at the same time because of the existing conditions of the equipments, etc, be taken up one after another:—

Bacteriological Room (of Research Division).

(1) Study of oils and fatty matters.

With regard to Bean Oil forming one of the staple products of Manchuria, an industrial enterprise has been reared thereupon on the completion of partial investigation. Still, there are sundry subject matters related thereto that await closer enquiry.

Besides, there are hemp-seed, castor seed, perilla seed, etc., from which oil is obtained, and their study, too, is to be taken up.

(2) Study of the constituents of Soya Bean Press Cake.

The direct applied uses of albuminous substances, which make up the main ingredients of Bean Cake, together with the utilities of their decomposition products can scarcely be yet regarded as fully studied out already. Neither can their fundamental chemical researches, either. As to other constituents, there are points that have to be unraveled and defined.

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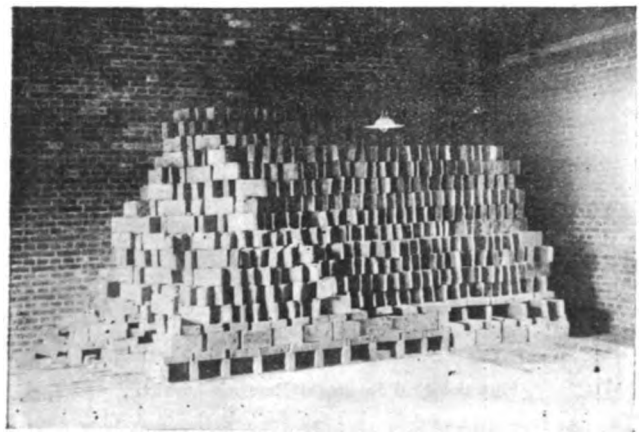
All these subjects are to be further investigated for the purpose of enlarging the utility of the same constituents.

(3) Study concerning textile fibres.

Among the fibre industries in Manchuria, the most important is how to improve the quality of tussah silk. This study has already been partially completed. Still there remains the fundamental study of wild cocoons, viz., the composition of their layers, properties of the pupae, and also the comparative study of wild cocoons with willow cocoons.



"Cheeze" Room (of Sorghum Alcohol Distillery).

Again, no less important is the study of the vegetable fibres available in Manchuria.

(4) Study of fermentation products.

Many ferment industries such as the manufacture of sorghum alcohol, millet wine, soy, vinegar from the indigenous products have been founded upon the experiences acquired since early days in China. On this account, there are many features that stand in need of scientific study and investigations.

This Division, through a biological and chemical research and investigation concerning these ferment industries, has been studying how to turn to most account all kinds of raw materials, and good results have been obtained.

Still, the scope of investigation being very extensive, there remain many subjects left for future researches.

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(5) Study of Composition of Plants.

Many plants indigenous in China, especially in Manchuria, have their compositions not yet clearly ascertained. In particular, what are commonly known as medicinal herbs have a good number of them, which, because of their being available in large quantities, promise fine possibilities more as indutrial raw materials than medicinal herbs.

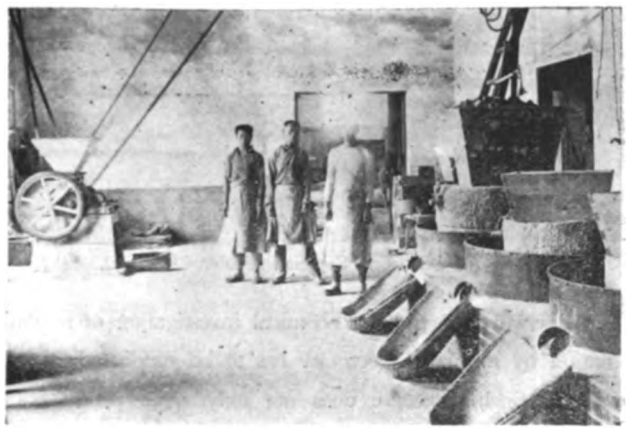
However, as to the composition of these herbs, there remain points that still await unraveling.

Such points are to be taken up one by one so as to determine the chemical and pharmaceutical properties and to enhance their utilities.

(6) Study Concerning Coal.

Of the Manchurian products, coal is one of the foremost importance. Its study is very complex and many sided and forms the axle of organic chemical industry.

In this Division, various investigations have been conducted specially regarding the low temperature dry distillation of coal and the separate distillation of the tar and the testing of the utilities of the different constituents have been put in hand.



Kaoliang Grinding Room (of Sorghum Alcohol Distillery).

Moreover, the study of pitch and shale is being carried on at the same time.

(7) Study of Salt Garden Products.

Salt, which is the chief article of the salt garden products in Manchuria, has varied uses, but its main utility as an industrial raw material lies in manufacture

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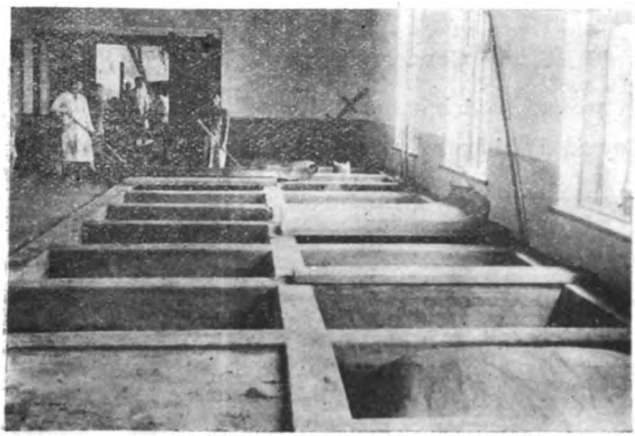
of soda which makes up the foundation of chemical industry. Therefore, as a provision for the future of chemical industry in Manchuria, the industrial research of salt, along with its utilities, are to be studied out.

Again, bittern, which is a bye product, contains bromine, magnesia, potassium, etc., and its study is also included in our plan.

(8) Study Concerning Minerals in General.

In the investigation of the utilities of minerals in general by this Division, not only minera's of silicic compounds, but also barytes, magnesite, limestone, fluorite, and other minerals of alkaline earth, metallic ores, and other minerals to be discovered in future are made subjects of chemical experiments and physico - chemical examinations to the end of ascertaining their industrial possibilities.



Rows of Cellars (of Sorghum Alcohol Distillery).

Especially, the physico chemical investigation of resolution and chemical combination by means of electricity has to be conducted in many cases under high pressure. Such procedure does not only serve purely scientific purposes, but is also necessary for opening the way for industrial application.

II. RESULTS OF WORK.

As regards the results of the work carried on at the General Laboratory, reports have been prepared seprarately, giving full details therein. It would, however, tax the effort of those other than the specialists having a professional interest in such reports to go through them.

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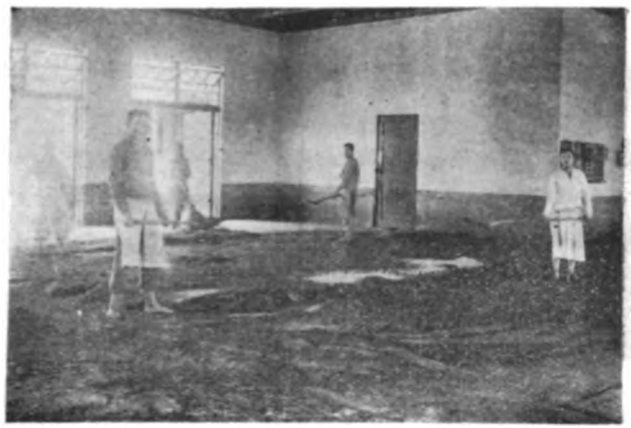
On this account, a brief of the chief matters of investigation so far pursued by the Laboratory is given under in plain English so as to enable the lay public to get a fair understanding of what it is.

The subjects of our investigation and testings have been sucessfully terminated in some cases; in other cases, success has been won only in theory, whilst on the practical side, they have proved failures; again in several cases, part of the stages has been passed, still the research is only half way advanced.



Cooling Room (of Sorghum Alcohol Distillery).

The following is intended to give information on what the Laboratory has done so far, with the object of shedding some light upon the present situation of the Industrial Manchuria.

(1) Sorghum Alcohol.

Sorghum alcohol distilling or manufacture of the popular Chinese beverage very often known as shumshu may be held up as one of the two leading industries of Manchuria, the other being bean milling.

The total outputs of this beverage in the Three Eastern Provinces alone are estimated at 400,000 *koku* (or 80 million gallons) a year, valued at ¥20,000,000.

The method of manufacture is indeed unique and is by the peculiar Chinese method of solid fermentation.

Liaoyang and district is the greatest distilling centre in Manchuria, which is noted for the splendid quality of the outputs.

As raw materials for *shumshu*, kaoliang (a cereal grown extensively in South Manchuria) and *cheeze* are used.

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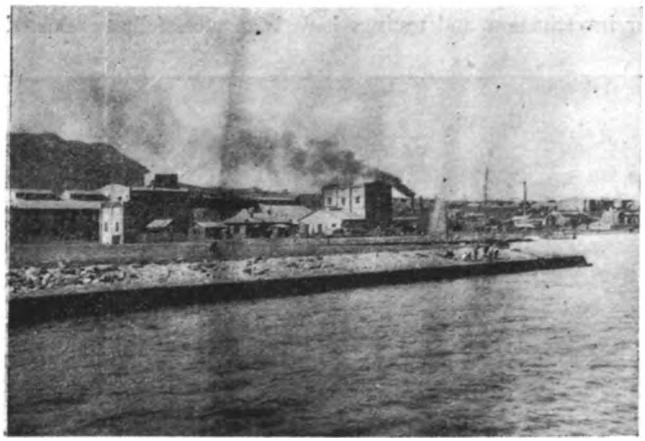
To begin with, kaoliang is cracked into two or three parts, then to be steamed. After cooling the steamed kaoliang, it is mixed with about 10% of pulverized *cheeze*. The mixture is then put in the fermenting cells sunk in the ground in rows, then the top of these cells is hermetically sealed with mud, so as to cause saccharizing fermentation. When the fermenting process is completed in nine or ten days, the Kaoliang is distilled, and a distilled beverage containing strong alcohol is obtained. This is sorghum alcohol.



Experimental Bean Mill (worked on chemical extraction method). Now transferred to management of Messrs. Suzuki & Co.

The fermenting cells having much starch left, a new supply of steamed kaoliang is added, together with some *cheeze*, so as to have the saccharizing fermentation repeated.

A rough description of kaoliang, *cheeze*, etc., which are used as the raw materials is given under :—

(a) Kaoliang.

Kaoliang is a kind of the staple produce of Manchuria, and its total annual output is put at 324,000,000 bushels. It has a great variety of kinds, but is classified into the three kinds of white kaoliang, brown kaoliang (used by the Chinese inhabitants as staple food-stuff), and dark brown kaoliang, according to the colour and shape of the grain by the cereal dealers and distillers.

For the manufacture of *shumshu*, dark brown kaoliang, which is the cheapest-priced, is used for the most part. The price is ¥3 per *koku* on an average.

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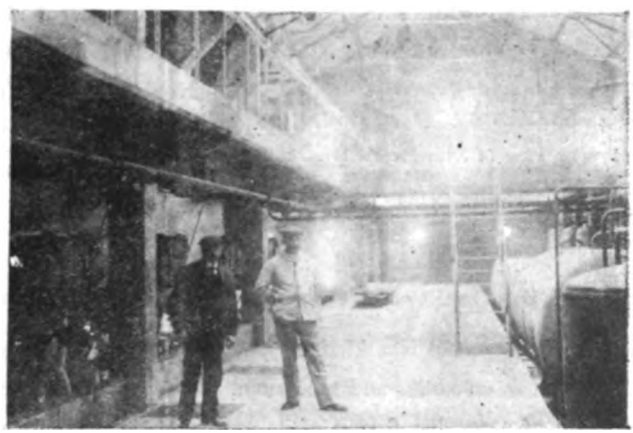
(b) Cheeze.

"Cheeze" has the property of saccharizing and fermenting the albumen contained in kaoliang, and performs the same function as *koji* (rice malt) in the fermentation of *sake* in Japan.

To make *cheeze*, a mixture of barley and red beans is cracked and then a certain quantity of water is applied. Then, the mixture is kneaded well, and is made into briquettes. They are then piled up in the *cheeze* room, in order to facilitate the growth of the microorganisms, which, at first, form mycelia resembling cotton fibre on the surfaces of *cheeze*, and this microorganic growth gradually extends inside, till it turns into a perfect *cheeze*, which is quoted at about 25 sen a piece.

(C) Outputs of Sorghum Alcohol.

At a sorghum alcohol distillery, with each still, the distilling process is repeated five times a day. This is treated as the working unit of a distillery. For each unit, about 1,500 *kin* of kaoliang and 330 *kin* of *cheeze* are used daily. The output depends a good deal in respect of quantity upon the quality of the *cheeze* used. On this account, special care should be exercised in selecting the best suitable kind. Again, the degree of moisture of the kaoliang mush, how well the raw material has been kneaded, and the conditions of the weather and the climate also have more or less effect on the turnout of the *cheeze*. Especially, in summer, the wrong selection of *cheeze* will cost the distiller a decrease of the output by about 10%.



Interior View of Experimental Bean Mill.

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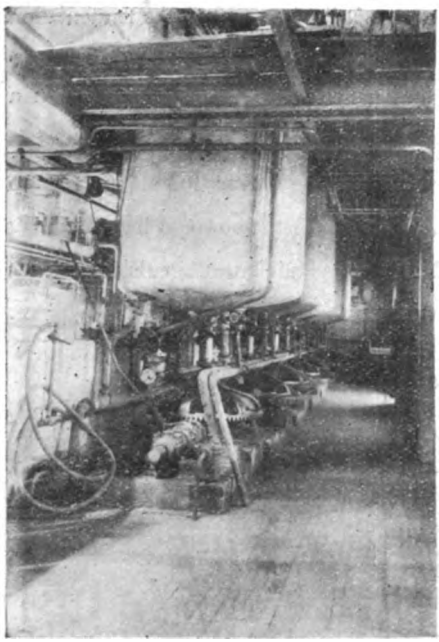
Under auspicious circumstances, 500 *kin* of sorghum alcohol containing 57.5% weight of alcohol is obtainable per day per working unit. When this output is computed by the net quantity of the alcohol, it amounts to 287.5 *kin*.



Interior View of Experimental Bean Mill.

Figuring the starch percentage of Kaoliang at 60% and that of *cheeze* at 44%, for argument's *sake*, the total starch quantity used by each working unit will amount to 1,045 *kin* per day. Theoretically, 593.8 *kin* of pure alcohol may be obtained. However, the actual alcohol percentage obtainable is 287.5 *kin* as above mentioned, which amounts to only 48.4% of the total theoretically obtainable. Compared with the finest results so far had in the manufacture of alcohol from starch, according to the investigation of Mr. Maercker, what is available by the sorghum alcohol distillation above mentioned represents only half the quantity given by Mr. Maercker. This indicates that there is a lot of room for improvement.

(D) Quality of Sorghum Alcohol and Grounds Left.

Sorghum alcohol is a kind of spirituous liquor, containing from 60 to 65% of alcohol. It is colourless and transparent; it somewhat partakes of an acid and is possessed of a peculiar flavour of its own. Mixed with water, it will turn turbid. In order to judge its quality, testing by frothing the beverage is resorted to in addition to testing by the flavour. To subject the liquor to this test, it is first mixed with a certain quantity of water; the mixture is then shaken up so as to become frothy. The longer time the froth takes before its disappearance, the finer is it declared to be in quality. This liquor generally sells at about ¥18 per 100 *kin* (or ¥1 per gallon).

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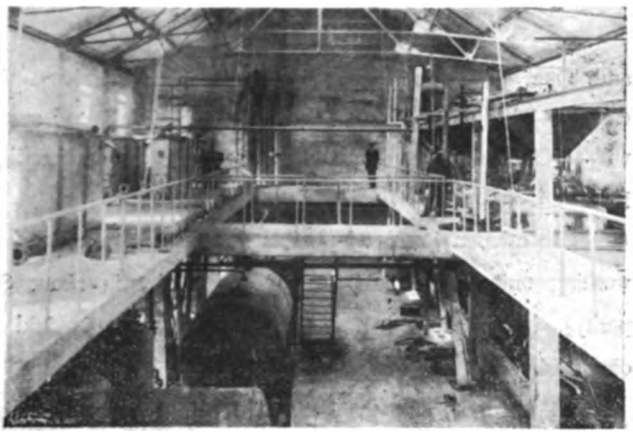
Besides being used as a beverage as it is, it also makes a substitute for alcohol and is further available as a material for concocting different kinds of mixed spirits.

Next, the grounds given as a bye-product by a working unit per day range between 1,800 and 2,000 *kin*. The grounds, when air-dried, still retains starch to the extent of 30% or so and is admirably suited as hog-feed, being quoted ordinarily at ¥12 or so. Thus, the grounds form an important item of earnings to the distillers, the proceeds to be realized therefrom being sufficient to make good the whole of the direct producing cost, excepting the costs of coal and distillation tax.

(E) Improvement of Distilling Method.

As to the distillation of sorghum alcohol, the popular method has been fashioned out of the traditional practice, independent of science. As may be expected, it leaves ample room for improvement.

On this account, the General Laboratory has conducted its investigations on both bacteriological and chemical lines, and the results attained have been turned to account for the prosecution of the study to improve the quality.



Interior View of Experimental Bean Mill.

The actual results of the investigations so far gained may be summarized below:—

Manufacture of Calcium Lactate.

As *cheese* is used for distilling sorghum alcohol, the fermentation process is necessarily imperfect, further requiring comparatively high temperature to start the

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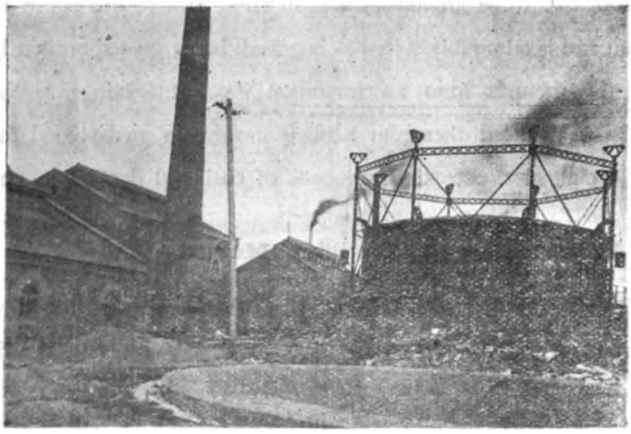
fermenting process. This makes a lactic acid fermentation unavoidable. In consequence, lactic acid is retained in the grounds to the amount of about 2%. The extraction of the lactic acid from the grounds does not detract from their quality as cattle-feed, and so the manufacture of lactic acid from these grounds is worth taking up as a bye-industry to the distilling business.



Dairen Oil and Fat Industry Co.

Let the grounds be neutralized by mixing calcium lactate, and let them be extracted well by water. Press and filter the mixture, and then evaporate and condense the filtrate to a suitable degree. Then, leave it at a cool place, and a good amount of calcium lactate will be crystallized out. Separate it from the mother liquor and dry it. The product is crude calcium lactate.

The calcium lactate obtainable from the average daily yield of grounds per working unit, which amounts to 1,900 *kin*, is about 82.4 *kin* (of 80% in purity), being about half the quantity of what is laid down by science as obtainable.

The grounds, after the lactic acid being extracted, retain only a small quantity of free acid. They wear a blackish hue, and the growth of mould on the surface will be noticed after a few days. But, inside, bacilli acidi lactici chiefly are propagated. A rise in temperature will quicken acid fermentation, and the residue will get discoloured again. Still, they are as good as the ordinary grounds as cattle-feed, which is absolutely proof to decay. From the calcium lactate, lactic acid may be obtained by decomposition. This is available for ferment, dyeing, tanning, and other industries.

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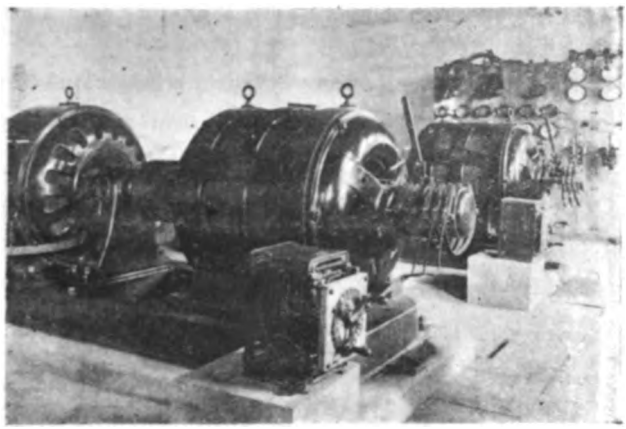
Improved "Cheeze" Meal.

For making *cheeze*, red beans and barley, both comparatively high-priced, have to be used. Moreover, enough to last for a year is to be made at once to be laid by. This point makes up an economic disadvantage.

At the Central Laboratory, the mould obtained by a close search from *cheeze* by a special process, which has a strong saccharizing property, is cultured on the grounds, so that a substitute for *cheeze* may be had whenever wanted. The improved Chinese *cheeze* thus obtained costs only about half the amount wanted for ordinary *cheeze*.

The above is what has been actually gained by experiments at the Central Laboratory.

The most important point of improvement in making sorghum alcohol is to obtain the largest amount without impairing the flavour. The experiments by the Central Laboratory have established the difficulty of increasing the production by the solid ferment method in popular vogue, because of the acidity of the mush. Next, the application of the ordinary method of distilling alcohol has proved the unfailing increase of the production, although losing something in flavour.



Interior View of Dairen Oil & Fat Industry Co.

Thus, the results gained so far are far from satisfactory, very much to the regret of the Laboratory authorities.

The main point of study concerning sorghum alcohol consists in completely harmonizing production amount and quality to the end of making the industry economically workable as highly as possible.

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On this very line, the study of the same subject is being pushed forward.

II. Kaoliang Pulp.

The Kaoliang is sown in the latter part of April. It grows fast in summer. The stalk is from 1.5 to 2.5 centimetres and is 2.5 to 3 metres tall. The ear appears on the top and gets ripe in the latter part of September. The harvesting season comes early in October.

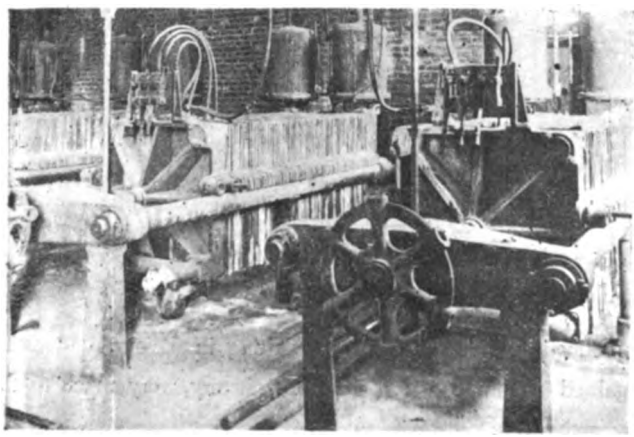
Kaoliang stalk: The Kaoliang stalk has from 8 to 10 joints, from which the leaves grow. The stem is made up of bast and pith. The bast is 1 to 2 centimetres thick and rich in cellulous substance. It is nearly as strong as the bamboo. The pith consists of a spongy cork-like substance.

These parts may be divided on an average as follow:—

Stem, 73% { joints 20%
the rest { barque 72%
pith 28%

Leaves 27%

Kaoliang Pulp: Kaoliang Pulp is a cellulose derived from the kaoliang stalk treated chemically. The barque of the stem gives the largest quota of cellulose. The joints and leaves come next. The pith has nothing that may be called cellulose. The cellulose belongs to what is classified as woody cellulose, and belongs to the same class as what is contained in timber, bamboo, straw, etc. In point of quality, it ranks between bamboo and straw and makes an excellent substitute for timber pulp.



Interior View of Dairen Oil & Fat Industry Co.

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The results of the analysis of the kaoliang stalk, as conducted at the General Laboratory, are as under:—

Moisture, 15.96% Cellulose, 39.91% Cork-like substance 39.55% Ash, 4.55%

The above places the cellulose quantity obtainable from the kaoliang stalk below what is to be had from timber, bamboo, and straw standing at the respective rates of 45-50%, 43-45%, and 40-45%.

How to manufacture kaoliang pulp: There are two methods of manufacturing chemical pulp, viz., sulphite method and soda method.

By the sulphite method, the cellulose only is extracted from the kaoliang stalk by the use of a solution of calcium bi-sulphite. By the soda method, a solution of caustic soda is used.

Ceramic Experimental Institute (whole view).

For the manufacture of timber pulp, the sulphite method is used most popularly, because of the producing cost being comparatively cheap and also of a good percentage of cellulose being available.

The use of the sulphite method in making kaoliang pulp will give a flattering quantity of cellulose, but the colour of the output leaving much to be desired, a large amount of bleaching powder is required for bleaching purposes, which fact takes off much from making it commercially desirable. On this account, the soda method is the only one available. To apply this method, the kaoliang stalks carefully selected are cut to suitable lengths, then they are steamed and boiled for about five hours in a tightly closed vessel with a solution of caustic soda of about 4° Be. at the atmospheric pressure of from 2 to 4. They are next washed in warm water and then is washed and crushed in a vessel often known as beater.

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Then, a solution of bleaching powder is applied to decolour the solution, and after another washing, it is dried and pressed into plates.

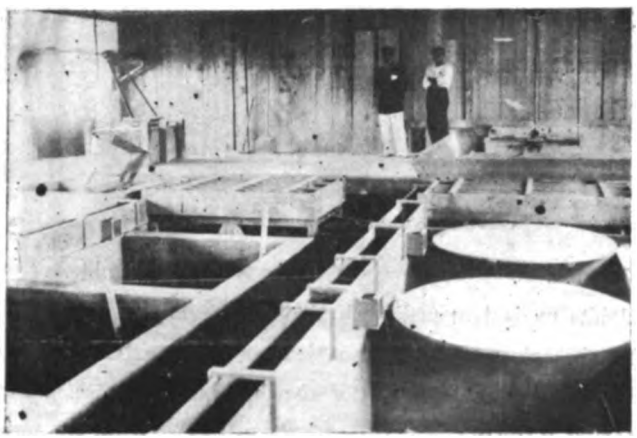
The experiments conducted at the General Laboratory show that, for the manufacture of 1 *kuan* (or 8⅓ lbs.) of bleached pulp, the materials and chemicals required are roughly as follow:—

Kaoliang stalks... 25 lbs. Caustic soda... ... 3 lbs. Bleaching powder... 3 lbs.

Caustic soda may be used repeatedly by means of recovery. So, the actual loss incurred during the manufacturing process only has to be made up, when the caustic soda method is to be applied on an industrially working footing.

Especially, by the use of the latest invention known as the sulphite soda method, sulphite soda, which is much cheaper, may be used in place of caustic soda. By this means, the producing cost may be remarkably saved.

Uses of Kaoliang Pulp: As already stated, kaoliang pulp bears a close resemblance to timber pulp, and the two have practically the same uses. Unbleached, either is good only for making paper of indifferent quality like imitation paper. When bleached, either is available for making wrapping paper, printing paper, note paper, and other kinds. When mixed with such superior pulp as is made out of *mitsumata* (Edgeworthia Gardener), mulberry, etc., it will put out a high grade paper fit to be a substitute for *mino* paper (a kind of Japanese paper of very excellent grade).



Precipitation Room (Ceramic Experimental Institute).

In recent years, with the advance of chemical industry, general pulp has become available, in addition to the manufacture of paper, as other chemical

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industrial material for such as cellulose acetate, viscose, artificial silk, etc. Kaoliang pulp, too, may be put to like uses.

Industrial feasibility of manufacture of Kaoliang Pulp:

As remarked above, the Kaoliang stalks, if subjected to the soda method, give a pulp almost as good as timber pulp.

If a place like Fushun should be selected to locate this kind of industry, the three important industrial assets of water, motive power, and fuel may be had to any desired amount. Moreover, the place will furnish an abundance of raw materials which defies comparison.

Supposing about two tons of kaoliang stalks to be obtainable from 1 *hsiang* (or about 2,000 *tsubo*) of kaoliang field, the estimated total quantity of the stalks to be had from the whole of the Three Eastern Provinces (Manchuria), is put at 9,000,000 tons a year, from which 3,000,000 tons of pulp may be manufactured.

Glazing Room.

To be on a safe ground, only ten percent of the entire supply of kaoliang stalks may be accepted as available for pulp-manufacture. Still 300,000 tons of pulp may be obtained.

The fact that this particular industry still remains undeveloped may be ascribed to the following causes:—

1) Kaoliang pulp, unlike timber pulp, stands in need of a costly chemical like caustic soda, thereby raising the cost of production.

2) The kaoliang requires a much larger tract of land than timber to give a certain amount of raw pulp-making material. This increases the difficulty in collecting materials and also the cost of their transportation.

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3) The kaoliang harvesting time is limited to a comparatively short space of time, and the raw materials collected in the short space of time have to be stored for a long period, and besides, owing to the bulky nature of the stalks, there is larger difficulty in storing them, in addition to needing no little capital.

4) The kaoliang stalks being used almost exclusively hitherto as building material and fuel by the Chinese inhabitants, some suitable substitute will have to be supplied to the inhabitants, if a good quantity thereof is to be appropriated for pulp manufacturing.

As mentioned above, the manufacture of kaoliang pulp has its own advantages and disadvantages, and like the soda industry in the Kwantung Leased Territory, it awaits further study.

III. Manufacture of Potassium Salts from Kaoliang Stalk Ash.

The uses of potassium in Japan have been in the directions of making gun powder, matches, fertilizer, glass, and medicines.

Hitherto, the annual outputs of potassium amounting to about 1,700 tons have been put out from kelp in Hokkado, Chiba, Kanagawa, and Miye Prefectures.

Porcelain Moulding Room.

With the development of this industry, the demand for potassium has increased, and at length, the duty-free import of potassium chloride and potassium sulphate from Germany was arranged, their import amounts in the fiscal year 1913 amounting to 1,700 tons and 2,500 tons respectively. Since the outbreak of the great War, the import of these potassium materials has been completely blocked, and in consequence, a hunt for some likely substitutes had to be taken up.

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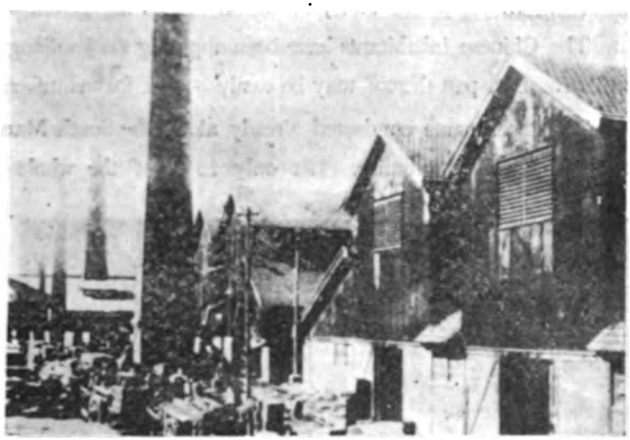
As materials for the manufacture of potassium salts, kelp, bittern, sugar cane ash, molasses, felspar, etc., are available, but if any materials are to be sought in Manchuria, kaoliang stalk ash may be counted first of all.

The area of cultivation of kaoliang in Fengtien Province alone is about 4,800,000 acres. Figuring the output of the kaoliang stalk at 800 sheathes or about 2 tons per 1 *hsiang* (about 2,000 *tsubo*), the aggregate may be placed at some 10,000,000,000 *kin* (or about 6,000,000 tons. Part thereof is employed as building material, household articles, etc. But, the major portion thereof is used as fuel for heating and cooking. Supposing some 70% of the total is used as fuel, the aggregate will amount to about 7,000,000,000 *kin*, and computing the rate of production of ash from the kaoliang stalk at 10%, 700,000,000 *kin* of ash will be obtainable.



Fire Brick Kiln.

According to the result of analysis, kaoliang ash contains about 10% of a constituent soluble in water, inclusive of about 4.4% of potassium oxide. Compared with other kinds of cereal stalks, the percentage is rather low, but, if compared with wood ash, the potassium percentage may be regarded as fairly large.

When this percentage of some 4.4% of potassium is made to combine severally with such as carbide, sulphate, and chloride, the following are obtained :—

Potassium carbide, about 35%
Potassium sulphate, about 25%
Potassium chloride, about 25%

On the above bases of calculation, out of 70,000,000 *kin* of the soluble constituent contained in 700,000,000 *kin* of kaoliang ash, some 15,000 tons of potassium

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carbide and about 10,000 tons each of potassium sulphate and potassium chloride may be derived.

However, the percentage of potassium salt contained in kaoliang ash varies according to places. In the regions north of Fengtien (Mukden), a marked increase of carbonate is noticed, while, in those south thereof, the increase of chloride is observed. In the above table, the mean figures are given.

The Chinese inhabitants have been applying the kaoliang ash to the farmland as fertilizer. But, part thereof may be easily bought for manufacture of potassium salts.

The experiments conducted already along the South Manchuria Railway Lines have given a good promise. Let only 10% of the whole of the ash output be used for the purpose indicated above, the total yield of potassium salts will still be 3,000 tons.

Inside Fire Brick Kiln.

At the Central Laboratory, manufacture of crude potash, how to refine it, and also how to separate the different kinds of salts have been experimented upon and studied, and the different products of pure quality have successfully been obtained.

However, as to the changed economic status attending the fall of the prices after the great War, due consideration ought to be expended.

For instance, refined potash could be paid for at more than ¥12 per 100 *kin* during the War, and still a reasonable profit could be realized, but now ¥7 or ¥8 per 100 *kin* seems the commercially workable limit.

Sensible management being granted, the potassium industry will grow in due time into one of the indigenous enterprises in Manchuria, but also one that cannot be neglected in time of need.

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IV. Maize and Kaoliang Starch.

The total maize outputs in Manchuria are placed at about 6,000,000 *koku* per annum. Except what is used as food-stuff for the native inhabitants, it admits of export. However, transportation over great distances often causes deterioration in quality. Accordingly, starch may be made therefrom advantageously, so that it may be reduced in bulk and converted to a safeer merchandise.

From this viewpoint, the General Laboratory has carried on experiments.

Hitherto the manufacture of maize starch in Japan has been conducted on a small scale and in quite a primitive fashion.

At the Central Laboratory, a running trough system of perfect appointments, although on a small scale, has been employed, and by means of hot air drying, trial manufacture has been successfully completed, with flattering results.

When maize is cracked, the endostom may be readily separated, and from this, the bye-products of maize oil and refuse are obtained. Out of the grounds after the separation of the endostom, about 50% of starch has been recovered, that is to say, from 100 *kin* of maize,

50 *kin* of starch
8 *kin* of skin
1.8 *kin* maize oil
6 *kin* of oil grounds

are to be had.

Again, the skin, containing gluten, fibre, and starch, will make an excellent cattle-feed. And the oil grounds, too, are as good as Bean Cake, etc., as cattle-feed.

Glass Factory.

Next, kaoliang is produced in Manchuria to the annual amount of about 16,200,000 *koku* which is used chiefly as food-stuff and for distilling purposes. Still there is plenty of room for export. The manufacture of starch has been

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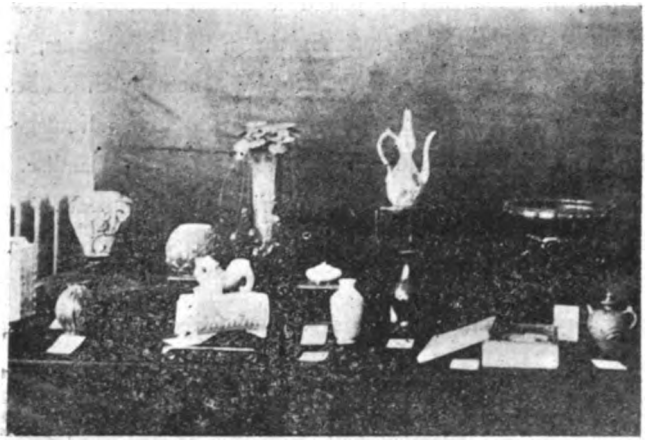
carried on among the inhabitants from old times. It is done by way of precipitation by fouling. The product thus put out has a disagreeable odour and is not milk white in colour. Besides, the amount available is far from satisfactory. Then, because of the difficulty of separating the skin of kaoliang, the starch retains some of the reddish pigment of the outer skin, which can not be removed.



Exhibition Room.

At the Central Laboratory, an easy way to separate the outer skin by means of a special alkaline method devised by the Laboratory has been successfully invented. From the skinned kaoliang, starch has been experimentally manufactured by the same means as used in the case of maize, and as a result, about 55 *kin* of starch and some 25 *kin* of skin have been gained from 100 *kin* of kaoliang. This skin, too, makes a fine cattle-feed.

Corn starch is widely known and used popularly. But, kaoliang flour is known only in a limited circle. In point of quality, it is inferior to potato starch, but is decidedly superior to sweet potato starch. If the way is opened in future for the use of starch in dyeing and weaving and for other purposes, an enormous demand may be created in course of time.

As to price, no definite figures can be given here. But in case of the outer skin separated being so treated as to popularize it as cattle-feed, when the price of the raw material is considered, this industry may be placed on an economically workable footing.

In short, the manufacture of starch is one of the indigenous industries that may be fostered in future.

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V. Beans and Products.

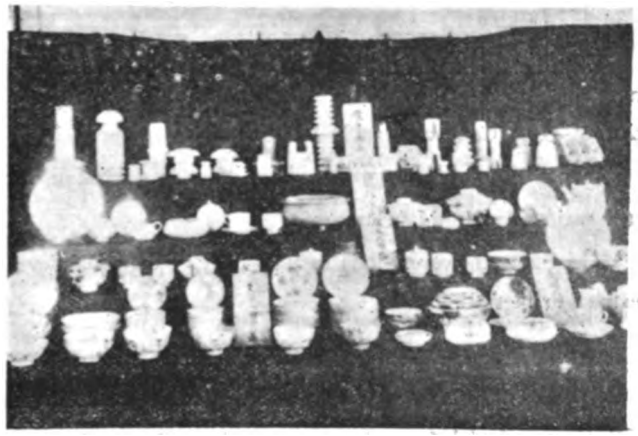
That Beans take up the foremost place among the staple products of Manchuria is universally known. The aggregate annual yield in the three Eastern Provinces amounts to about 18,000,000 *koku* or 90 million bushels, of which what is consumed in Manchuria is 4,000,000 *koku* or 20 million bushels, what is exported abroad amounting to 5,500,000 *koku* or 27,500,000 bushels. The balance of 8,500,000 *koku* may be set apart for the manufacture of Bean Oil and Bean Cake.

The constituents of Beans vary more or less according to their kinds, but the percentage of oil forming the most important constituent ranges between 17 or 19%, whilst albumen amounts from 35 to 40%.

(A) Benzine Extraction Method.

Bean milling is conducted at bean mills, and may be divided into two kinds. One kind is the expression method. This has developed from the wedge method of old times to the modern hydraulic pressure method. The other kind is the benzine extraction method. This method has been introduced by the Central Laboratory for the first time.

By this method, Beans are first crushed, and the oil matter is extracted by a chemical process. Then, the benzine is distilled and removed in separate vessels, leaving Bean Oil. The residue left is called Bean Meal.



Samples of Porcelain Ware.

By ordinary pressure method, the oil percentage obtainable is only 9 or 10%. But, according to the chemical extraction method, 14 or 15% may be obtained.

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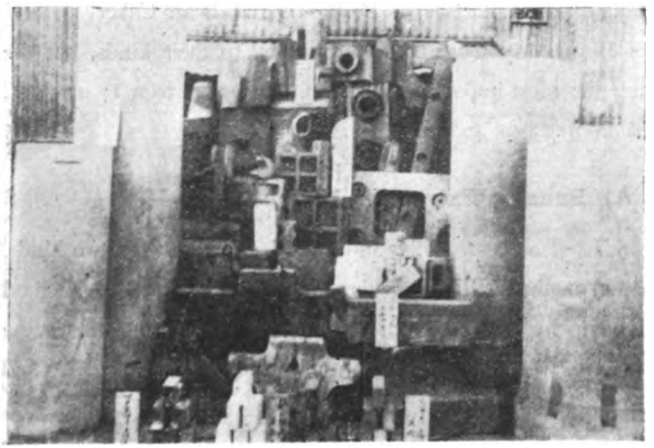
At the same time, the residue has the least oil percentage which makes it the most suitable manure.

The Central Laboratory founded an experimental mill in October, 1911. operating it by the benzine extraction method. As the experiments regarding the same were completed in September, 1915, the South Manchuria Railway Company transferred the plant to Messrs. Suzuki & Co. Compared with the expression method, advantages are gained in the superior quality of the residue, the increase of the oil percentage, and the saving of labour. But on the other hand, there are also disadvantages. Firstly, the plant must be on a comparatively large scale, requiring a heavy outlay for equipments. Secondly, the price of benzine indicates a rising tendency. Thirdly, the transportation of Bean Meal is not so simple as that of Bean Cake obtainable by the expression method.



Output of Fire Brick Kiln.

On this account, a good number of mills worked on the expression method are still maintained in Manchuria.

In future, however, it is easy to foretell the gradual development of the chemical extraction method.

(B) Hardened Oil.

Bean Oil belongs to what is termed semi-drying-oil. In order to use it, like tallow, as material for making soap and candles of fine grade, Bean Oil must be converted into a non-drying oil by an oil hardening process. This process is applicable not only to Bean Oil, but also to fish oil, larva oil, vegetable liquid oil, etc.

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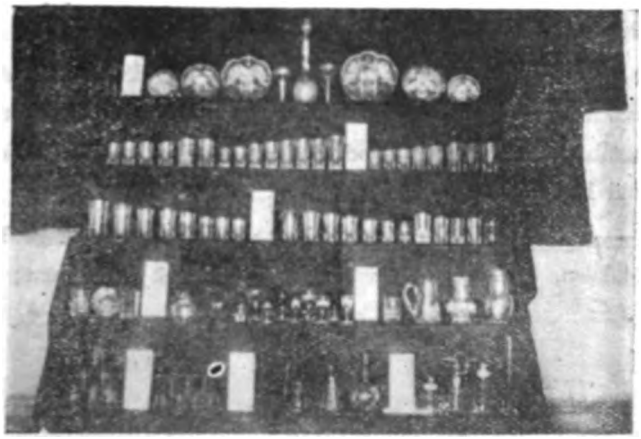
To explain the hardening method chemically, esters of unsaponified fatty acid combine with hydrogen through the medium of a catalyzer, turning to an ester of saponified fatty-acid.

When the oil has wholly turned to an ester of saponified fatty-acid, it assumes a solid form under ordinary temperature, and in this changed form, it is called hardened oil.



Products of Glass Factory.

At the Central Laboratory, a painstaking comparative study of various methods of hardening Bean Oil and also the method of manufacturing nickel which serves as catalyzer has been made, and the object it has had in view has been accomplished. The results of these investigations have been turned over to the Dairen Oil & Fat Industry Co., which has further improved the process and is now putting out different kinds of manufactures extensively.

(C) Solite.

Solite is a kind of water paint and is manufactured by the use of albumen contained in Bean Cake. It was invented incidentally to the study of Bean Cake at the Central Laboratory. From Bean Cake, as much albumen as possible is extracted by a suitable method, and to this a stated quantity of calcium hydroxide and pigments is applied, and after being kneaded by a kneadin gmachine, a suitable anticeptic is to be added. Before being applied, it ought to be shaken and stirred well. It may be diluted in water at the rate of about 3 *sho* of water per 100 lbs. of solite. It is applied like a paint with a brush.

It is being manufactured and sold at the Solite Manufacturing Co., Dairen.

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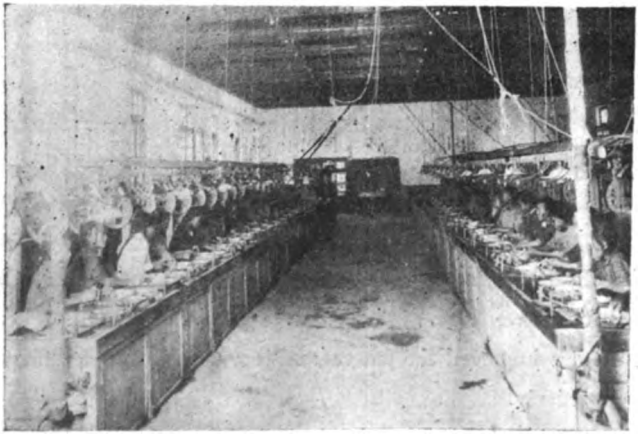
VI. Medicinal Herbs of Manchuria.

Demand for medicinal herbs is not extensive in Japan. In China, however, they are still in popular use.

In South Manchuria there are about four hundred kinds of such herbs in general use. Of these what may be called indigenous in the three Eastern Provinces number over a hundred kinds put out principally about Kirin, Tiehling, Mukden, and Liaoyang.

About Kirin, the district along the Changpai Range supplies most; about Mukden, does the hilly region about the East Mausoleum; about Liaoyang, the localities about Chienshan (Thousand Hills); and about Tiehling, supply is obtained from its environs and part of Mongolia.



Water Reeling Room (Tussah Filature) (an improved system).

Yingkou is the chief distributing centre for these medicinal herbs and plants, and most for export passes through that port.

The total annual outputs from the various districts cannot be ascertained, but rough estimates may be made as under:—

Kirin and Mukden, about 500,000 *kin* (or 666,000 lbs.) each.
Liaoyang and Tiehling, about 250,000 *kin* (or 333,000 lbs.) each.

The aggregate amount distributed at the port of Newchwang (Yingkou) in 1920 was about 800,000 *kin* (or 106 million lbs.) valued at about S.¥240,000.

The one medicinal herb, that is worthy of special mention, is liquorice root. Since it was exported from Chengchiatun (on the Ssupingkai-Taonan Line of the Chinese Government Railways) to the extent of some 100,000 *kin* (or 133,000 lbs.)

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in 1916, the export amount has been increased annually, and in 1920, the figure rose to about 1,800,000 *kin* (or 240,000 lbs.) valued at about S.Y 180,000. Its uses have been extended recently to the flavoring of *soy*, tobacco, etc., in addition to medicinal uses.

Among the medicinal herbs on the list prepared by the Japanese Pharmacopoeia and produced in Manchuria, there are henbane, apricot seeds, *lung-tan* (gentiana scabra Bge), *yuanchih* (polygala tennifolia, Willd), valerian root (valeriana officinalis, L.), etc.

Of the above, *yuanchih* is of excellent quality. The henbane seed is called *tienhsientzu* (hyoscyamus niger, L.) It has been found through the investigation of the Central Laboratory that it contains scopolamin in a large quantity.

To cite other matters of interest regarding medicinal herbs, etc., the constituents of which have been unascertained, the experimental study conducted at the Central Laboratory has established that from she-shengtzu (cnidium monnieri, cuss.) dextrorsal (+) pinene, isovaleric balnyl-ester is obtainable; from *fangfeng* (siler divaricatum, Bth. et Hk.), a large amount of dextrorsal (+) mannit; from paitouweng aenmone chinensis Bge), a pungent anemon oil; from *tsuyuan* (aster tataricus, L.), a volatile oil and also a crystal having a ketone structure, the composition of which is not quite clear; from *tanshen* (salvia miltiarrhiza, Bge), three new red pigments; from *tafengtzu* oil, optical active chaulmoogric acid and hydnocarpic acid; from *mupiehtzu* (momardica cochin chinensis, spr.), a polysacharide of the name of trehalose; from *shihhua* (Ramalina carycalis, Hch), usunic acic, and two new carycalic acids and *sekika* acid have been obtained.

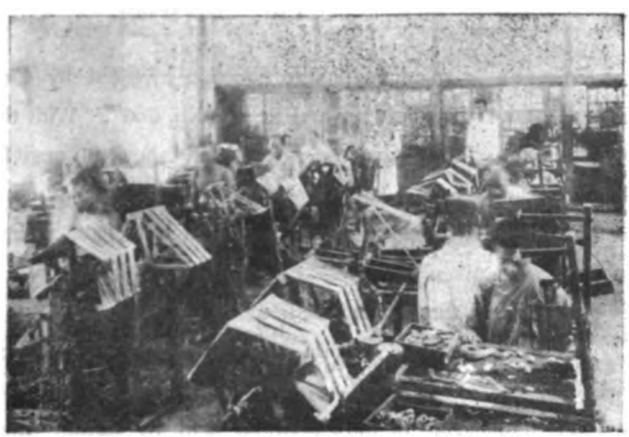

Plate Reeling Room (Tussah Filature) (the old Chinese system).

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The above discoveries have served to elucidate the nature, structure, etc.

Again, from *hoshonwu* (polygonum multiflorum, Th.), which has risen lately to be a sort of 'fad' as a rejuvenating agent, the two constituents of chrysophanic acid and emodin have been extracted, proving that it is of a similar property to rhubarb.

Experimental Hand Loom (Weaving Works).

All the above results of investigation have been published by the Central Laboratory.

As regards the other medicinal herbs, the composition of which is not yet defined, they await further investigations.

VII. Salvarsan.

Salvarsan is an anti-syphilitic injection invented by Dr. Erlich of Germany in 1912 and is popularly referred to as "No. 606". With the outbreak of the War, its import into Japan has been stopped, and how to manufacture it was studied out successfully.

The manufacturing process of salvarsan by stages, as invented by the Central Laboratory, is given under:—

1. Manufacture of aniline from benzine.
2. Manufacture of arsanilic acid by causing arsenic acid to act upon aniline.
3. Manufacture of nitro arsanilic acid by causing nitric acid to act upon arsanilic acid.
4. Manufacture of nitro oxy-phenyl arsenic acid by causing caustic alkali to act upon nitro-arsenic acid.

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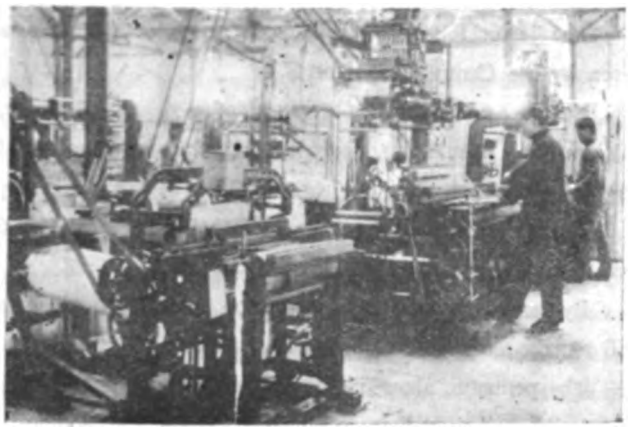
5. Manufacture of di-amino-di-oxy-arseno benzine by causing hydro sulphite to act upon nitro-oxy-phenyl arseno acid.

6. Manufacture of di-amino-di-oxy-arseno benzine hydrochloride by causing hydrochloric acid to act upon di amino-di-oxy-arseno benzine. This product is salvarsan.

Again, when formaldehyde - sulphoxylate is caused to act upon di-amino-di - oxy - arseno-benzine, what is styled neo-salvarsan is produced, whilst what is put out by causing caustic soda to act upon is called sodium-salvarsan.



Jacquard Machine Room (Weaving Works).

The First Pharmacy Co., Tokyo, is engaged in the manufacture of and sale of salvarsan practically on the same lines as laid down by the Central Laboratory. The product is christened "arsemin," instead of salvarsan.

VIII. Permutite, an Artificial Sand.

Permutite, an artificial sand, is a compound of sodium-aluminum-silicic acid, and the sodium contained therein may be easily replaced with various bases, such as calcium, magnesium, etc.

For this reason, it may be used as filtering sand, and a very hard water containing a deal of magnesium may be reduced to an almost perfectly soft water of zero degree.

The method of softening hard water by means of permutite is far simpler and surer than the lime soda method hitherto in vogue. Any filtered by this method is best suited to boilers, causing almost no incrustation.

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In Manchuria, water of more than ordinary hardness is met with at every turn. No inconsiderable economic good will be realized by the adoption of the permutite filtering method for water for supply to the locomotive engines and workshop boilers.

The Central Laboratory has succeeded in obtaining an artificial permutite which compares well with the German product.

The Japan Filter Co., Ltd., Osaka, turns out permutite according to the hints given by the Central Laboratory.

Needless to state, when water is softened with permutite, it gradually gathers calcium and magnesium, and its frequent reduction will be required. For the purpose of the reduction, the mere addition of salt water to permutite will do.

Then, the calcium and magnesium may be separated from permutite which will thereby be completely reduced.

By having recourse to this reduction method, the permutite softening appliances will remain serviceable permanently. Neither will it lose its filtering power.

The permutite above mentioned is a white crystallized fine sand, and may be chemically called sodium permutite. When the sodium contained therein is replaced with manganese, and the permutite combines with manganese oxide, it is called manganese permutite. This article is a black granular sand rich in invigorating oxygen. It has the power of eliminating the bacteria, ammonia, nitrous acid, and organic matter. For the reduction of this article, a solution of potassium permanganate should be used.

Samples of Tussah Silk and Fabrics.

By using manganese permutite, a pure good water will be obtained. It also furnishes an excellent water for industrial use, which should not be tainted with iron.

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above all, and it is placed within easy reach in a simple and unfailing manner.

The Central Laboratory has not only studied the above mentioned two kinds of filtering sand, but also has succeeded in lowering the producing cost so as to answer practical purposes.

IX. Magnesite and Lignoid.

In Japan, no magnesite mine worth exploiting has yet been found.

In 1913, an extensive magnesite bed was discovered near Tashihchiao, the junction station on the S. M. R. Main Line, whereat the Yingkou (Newchwang) Branch Line starts. It stretches from the east of Tapingshan and Tashihchiao Stations in the northeastern direction. It exists in an extended seam boarded in a long range from the south of Haicheng southeast-wards.

The magnesite bed, for which investigations have already been completed, runs to the length of about fifteen miles from east to west, in a width of about 1 2/5 miles. The height of the bed above the level of the ground is about 500 ft. The estimated magnesite reserve is placed at 20,000,000,000 tons.

It is a crystalline magnesite mine and contains magnesite of white, yellowish-brown, gray, black, and striped colours.

There are only a few other magnesite mines of the same class in the world. Amongst them, the Austrian and Hungarian products may be counted as the leading ones.

On the other hand, amorphous magnesite occurs commonly in Greece and elsewhere.

The composition of Manchurian magnesite may be analyzed as under:—

	Put out	
	at Kuanmahan	at Niuhsinshan
Magnesium carbonate	86.30	90.08
Calium carbonate	3.06	4.06
Silicic acid	4.16	1.12
Ferric oxide	0.67	1.18
Aluminium oxide	0.32	0.14

The above places Manchurian magnesite quite as a peer to any foreign products. Besides, it is found in an immense quantity almost without a parallel.

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The uses of magnesite are varied, the chief of which includes use as basic material for a steel works furnace. It is also required in the manufacture of refractory materials, magnesia cement, magnesia salts, metallic magnesium, paper, etc.

The Central Laboratory has taken up first of all the study of magnesite as raw material, for instance, as refractory material, as to the resistant power to itching, which may be regarded as the most essential property of magnesite brick, refractory power, etc.

On each of these subjects, a fundamental research has been made and nearly completed.

Still, the experiments are being continued at the Ceramic Experimental Institute of the South Manchuria Railway Company.

The study connected with the manufacture of magnesium compounds, metallic magnesium, etc., is now in progress.

Again, the investigation regarding magnesia cement has resulted in the manufacture of sorel cement, which is utilized in making lignoid.

Lignoid is a product invented by the Central Laboratory as a result of study.

This new enterprise was transferred to the South Manchuria Mining Co., in September, 1918, and the Company acts as sales agent as well as manufacturer.

In making lignoid, magnesite is first roasted and hydrochloric acid gas is blown in. Part thereof is made anhydrous magnesium chloride consisting of 80% of magnesium oxide and 20% of magnesium chloride, which make what is termed as sorel cement. With this, saw dust and colours are mixed, and this mixture is kneaded with water into a sort of a lignified stone. This is available as a substitute for linoleum as flooring material. If asbestos or pulverized cork is used instead of saw dust, a product of harder structure will be obtained. The price costs about 12 sen per lb., and for the flooring of one *tsubo* (36 square feet), to the thickness of a little over ½ inch, some Y12.50 will be wanted, inclusive of the labour wages.

X. Pottery Ware.

The manufacture of pottery wares in Manchuria has been confined from early times to only coarse earthen ware and jars. Even the cheapest table

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vessels in daily use by the inhabitants of Manchuria used to be imported from Chihli, Tangshan, and Poshan in Shantung. The rest has been brought from South China, Japan, and Europe. The annual demand is not less than ¥1,000,000. Especially, with the gradual spread of civilization in Manchuria in recent years, the demand for pottery and earthen wares has suddenly increased.

As the standard of living of the Chinese inhabitants goes up, they no longer care for coarse outputs from Tangshan and Poshan and are taking to finer and costlier articles.

The Central Laboratory, as the result of experiments, took up in the fiscal year 1913 a systematic test of a commercially workable possibility concerning the manufacture of table crockery for the use of the Chinese, who prefer white china, and also of the Japanese residing in Manchuria, insulators, etc., and the results were satisfactory. In October, 1920, the management of this particular industry was handed over to the Tahua Pottery Co.

Raw materials for the manufacture of the China ware include clay put out in Fuchou (lying just north of the northern boundary of the Kwantung Leased Territory), shale produced at Fushun Collieries, and porcelain earth found about Fuchou or about Pulantien, pegmatite produced about Pitsuwo, felspar produced about Haicheng, and white silicic stone occurring in the Kwantung Leased Territory.

Their composition consists of about 50% of clay, some 25% of felspar, and about 25% of silica.

The above composition is pulverized fine and mixed well, and after a good kneading, it is made into moulds. These moulds are baked, after drying, at a temperature of about 800° C., and then they are glazed or colour decoration is applied. Glazing is conducted in the down draught kiln or muffle according to the reduction glazing method at the temperature of about 1300 degree C. (Seger prism No. 10) for about 40 hours.

Some of the products have pictures painted further thereon and are baked in the Tunnel kiln at about 800° C.

At present, table crockery for the use of the South Manchuria Railway Company, insulators, etc., are made in answer to demand.

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For demand outside the Company, various kinds of table crockery for Chinese use, particularly bowls in popular vogue among the Chinese middle classes in Manchuria, are manufactured in large numbers. In addition, articles for Japanese use, too, have been experimentally made.

XI. Fire Brick.

Fire brick may be classified into acid, neutral, and basic. The raw materials wanted, such as clay, silicious stone, magnesite, etc., are all found in Manchuria in abundance, affording great facility in carrying on fire brick industry.

At the General Laboratory, experiments were begun in 1912. The enterprise has been gradually expanded, and the chief fire bricks manufactured are silicious brick and semi-silicious brick which both belong to the acid kind; clay brick belonging to the neutral kind; and magnesite brick belonging to the basic kind.

a) Silicious Brick (Dinas Brick).

Raw material and manufacturing method: As raw material, silicious stone occurring in the Kwantung Leased Territory is principally used. The stone is crushed, and a small quantity of lime, clay, etc., is mixed therewith as a cohesive. The mixture is then kneaded by a kneading machine. Next it is put in wooden frames, dried, and baked.

Uses: Silicious brick is used generally as a furnace material for high temperature industries. It is specially suited to the construction of horizontal furnaces, rotary furnaces, coke ovens, etc., in steel manufacture. This kind slightly expands under high temperature. Its refractoriness is put at 1,730 degree C.

b) Semi-silicious Brick (Semi-Dinas Brick).

Material, together with manufacturing method: Silicious stone, Fuchou clay, and burnt clay are crushed fine and are mixed in suitable quantities, kneaded well, and put in frames, and then dried and baked. As a substitute for silicious stone, silicious sand is often used.

Uses: It is a material for horizontal furnaces, coke ovens, rotary furnaces, etc., with the refractoriness of 1,730 degree C.

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c) Clay (Chamotte) Brick.

Raw materials and manufacturing method: Fuchou clay is baked and made burnt clay. It is then mixed with raw clay in a suitable proportion and is then kneaded by a kneading machine, put in the frame to be shaped, and dried and baked.

Uses: It is available as material for making furnaces and ovens in general as well as gas retorts, etc.

In particular, its uses are extensive as material for blast furnaces, glass melting pots, and its refractoriness is 1,750 degree C.

d) Magnesite Brick.

Raw materials and manufacturing method. Magnesite, as already stated, occurs in an immense seam in the neighbourhood of Tashihchiao. It is burnt at a high temperature into clinkers is crushed fine, and is mixed with a small quantity of iron oxide, other cohesive agents, and water. It is then put in proper shape by hydraulic brick press, and is baked after slow drying. The material for this kind of brick has no cohesive property, so brick is to be shaped by applying strong pressure by the special use of machinery in order to condense it.

Uses: Its chief use consists in building horizontal furnaces for a steel works and in lining electric ovens. Again, magnesite clinker is crushed and is used for making the furnace bed for horizontal furnaces. The refractoriness of magnesite is over 1,800 degree C.

The above mentioned manufactures have been used at the Shahokou Railway Workshops, the Fushun Collieries, the Gas Works, etc., of the South Manchuria Railway Company, and have given satisfactory results.

Since the Railway Company came to manage the Anzan Iron & Steel Works in 1916, experiments were conducted, with the object of supplying itself with all the brick necessary for the furnaces, ovens, etc. However, with the reorganization of the General Laboratory in June, 1920, the same experiments have been transferred to the Ceramic Experimental Institute and are still being carried on.

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XII. Glass.

The chemical composition of glass is extremely complex, but in a word, it is a silicate formed by melting down at a high temperature silicious stone or sand with an alkaline metal such as lime, sodium carbonate, potassium carbonate, etc.

About Dairen, silicious stone and lime stone admirably suited to glass manufacture are found in abundance; coal may be had on easy terms from Fushun, etc. Labour is also available cheaply. These make factors facilitating the growth of this industry.

The Central Laboratory commenced the experimental manufacture of glass in April, 1917, improving on what was in vogue in Japan, to the end of putting out manufactures that will compare favourably with Western products, and with this object in view, investigations have been carried on for the testing of technical and economic workabilities.

Raw materials: As to silicious stone, lime, and soda, which are common materials for soda glass, for the manufacture of white ware, it is imperiously necessary to select a cheap and pure material.

In Europe and America, fine natural sand is found in plenty. But in Japan proper, none so good as the Western sand has yet been found. Fortunately, in Manchuria, the whole of the Kwantung Leased Territory is full of both silicious stone and lime stone, the latter, especially existing in a large quantity as calcium carbonate. The Laboratory has made use of these.

Crucibles: The quality of crucibles, along with the construction of Kilns, form the two most important factors of glass industry. Still in Japan proper, in the majority of cases, the making of crucibles and kilns is undertaken by people engaged in this particular line of enterprise, apart from the glass manufactures. On this account, a scientific and practical study of the pots and glass making materials cannot be taken up, and this forms a serious handicap in raising the economic asset of this industry as well as the quality of outputs.

At the Central Laboratory, indigenous materials are used. As a result of a comparative study of raw materials obtainable at home and in Manchuria, side-mouthed crucibles were the first to be manufactured, followed by open-mouthed

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crucibles. At present, the durability of these crucibles has been brought up to near the German standard.

Pattern of Pots: The primary point for consideration in improving the quality of glass is to melt at a high temperature.

The pots hitherto in use in Japan proper have failed to come up to the mark. At the Central Laboratory, the regenerative ovens used in Germany and Austria, together with open crucibles, have been employed, to melt white glass, and the results have been flattering.

This may probably be the first successful experiment of the kind ever made in Japan.

Improvement of quality: Soda glass has been improved in quality, using indigenous products in the matter of raw materials, fuel, refractory materials, etc. By December, 1919, manufactures comparing well with the German and Austrian wares, which had been the objects of emulation, could be turned out. As to hard glass, prior to the great War, Jena (German) glass used to be supplied to the world's markets as standard goods. On the stoppage of its import into Japan in consequence of the War, the Central Laboratory took it up as another new subject of study, and has succeeded in turning out an output pronounced as fine as Jena glass.

As already observed, with the reorganization of the staff of the Laboratory, in June, 1920, all glass making experiments, like the fire brick industry above mentioned, were handed over to the Company's Ceramic Experimental Institute.

XIII. Wild Cocoons.

Manchuria is one of the greatest wild co-coon centres in the world. Especially, Antung, Kaiping, Siuyen, Kuantien, and Fenghuangcheng are the principal centres in Manchuria. The total outputs are about 220,000 or 230,000 baskets (each basket containing 35,000 or 40,000 grains), valued at between ¥8,000,000 and ¥9,000,000.

Wild silkworms are bivoltine and are reared twice a year, that is, in spring and autumn. The spring crop is used for the purpose of obtaining silkworm eggs, and the autumn crop alone is available for the filature.

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Spring wild silkworms are hatched late in April and mature in the middle of June; the autumnal crop is grown between the middle of July and the latter part of September. There are a large variety of feed for the silkworms, but the leaves of the *nara*, *kunugi*, *kashiwa* (a kind of oak), etc., are the chief feeds.

Again, what have been reared on the leaves of willows have been found superior to the other kind in quality, and feeding on these leaves promises to be popularized.

In reeling tussah silk in China, the wild cocoons are first boiled in hot water containing a solution of natural soda, and then they are reeled by means of a simple machine known as the plate reeling machine worked by the foot.

The wild filature industry is carried on most extensively at Chefoo, followed by Antung.

Then the natives of Manchuria reel wild cocoons by hand in their households, but this is scarcely worth noticing.

Raw tussah silk is classified into small-reeled and large-reeled, according to the sizes of reels used. The former is usually of fine quality, but the latter lacks uniformity in quality, and goods of indifferent quality are often met with.

As to the prices, they fluctuate according to the market tone. They were quoted in 1921 at from ¥700 to ¥600 per 100 *kin* of small-reeled variety and at between ¥200 and ¥400 for large reeled kind.

The number of grains of cocoons required for the manufacture of 100 *kin* of raw silk, allowing for more or less variation according to the kinds of cocoons, is about 210,000 grains on an average in the case of small reeled variety, the percentage of silk obtainable being about 50%.

Tussah silk put out by the natives has been of poor quality and has also had several defects. In order to improve the quality, the Central Laboratory instituted an investigation on the following lines:—

1. To facilitate reeling and to increase the silk outputs.
2. To improve the uniting of strands and to increase their strength.
3. To obtain yarn free from burls and fluffs.
4. To get yarn without stain or odour.
5. To get yarn of a colour as close to nature as possible.
6. To minimize the loss resulting from refining with soap suds.

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In order to accomplish the above object, a new method of reeling by water has been invented.

By this method, the cocoons are put in a 5% solution of hydrochloric acid to extract the lime contained in the cocoon tissues; then the cocoons are washed in water and are next put in an alkaline solution of 0.025%, having a tincture of formaline. They are washed again in water, and then put in another solution of peroxide of soda amounting to 0.18%. Then, after another washing, the cocoons are floated in warm water to be reeled.

From the practical reeling experiments, the maximum quantity of tussah silk obtainable has proved nearly the same as hitherto, that is, about 50%. However, the quality of tussah silk has been remarkably improved, to the extent of fulfilling nearly all the abovementioned expectations.

For instance, the improved silk produced at the Laboratory according to the water reeling method is found to give strands better united and having greater strength. The yarn is moreover of a uniform size and has fewer burls. Besides, it has no stain or odour, and, as it has only little impurity, the loss from refining with soap suds has been very much reduced. Moreover, in dyeing, the silk produced by the natives, both small-reeled and large-reeled, fails to take on a full and fresh colour. The improved silk has also gained no little in hardness.

The investigations of the Laboratory concerning the manufacture and weaving of tussah silk have enabled the management to study how to turn out non-patterned fabrics such as pongee silk, *habutaye*, and crepe on various kinds of raw materials, and how far, by the use of power looms, the original defects of the raw materials influence the working efficiency, and how the same defects act upon the quality of the outputs, and how efficient the weaving machine actuated by power can be.

As the result of these investigations, the improved silk has been found to suit to weaving by power, readily submitting to starching and spooling operations. The weaving process progresses quite smoothly, and the output is also of excellent quality. With regard to large reeled and small reeled yarn, its unsuitability for use by power looms has been found. Extra effort is required in the weaving process, and moreover the quality of the outputs falls short of the mark.

From the above experiments, the superiority of the improved yarn in every respect has been clearly established. Only, in conducting the water reeling

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method, a handicap is met with in the shape of difficulty to obtain skilled Chinese workmen. In order to overcome this difficulty, the Central Laboratory planned to train young Chinese apprentices, but few stayed long enough to acquire sufficient skill, and for this reason, this helped to raise the efficiency of the Filature but little.

It is perhaps because the Chinese little cared to learn the water reeling method, considering that it cannot be applied elsewhere, and preferred learning the traditional Chinese method.

By the native small-reeling method, an ordinary reeler may dispose of 1,000 grains on an average per day. With the water reeling method pursued at the Central Laboratory, it would seem that a similar standard of working efficiency ought to be maintained, but the actual results attained at the Laboratory fell to barely half the average owing to want of skill on the workmen's part.

Comparing small reeled yarn with improved yarn by the water reeling method, the latter will cost about ¥40 more in chemicals, ¥60-¥70 more in labour wages, and about ¥10 more, in sundry expenses, being from ¥110 to ¥120 more in all.

If superiority in quality and the difference in the loss amount from refining with soap suds (the loss rate for improved yarn being 10% or so, as against about 20% of small reeled yarn) are taken into consideration, the above difference in price ought not to be pronounced as unreasonable.

And, if the Chinese workmen should learn to take more kindly to the water reeling method, the same method may be accepted as a profitable and common sense one.

However, the Central Laboratory, apart from the training of Chinese apprentices, planned to let the Chinese workmen now on the staff give full play to their skill to the end of reducing the producing cost.

Following this plan, wild cocoons are not treated by the water reeling method, after subjecting them to the preliminary process above mentioned, but by the old plate reeling method.

The Chinese workmen will thus be made to feel more comfortable to keep at work. The same method eliminating steam, some saving is effected also on this score.

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The experiments have shown that the improved plate reeling method, compared with small reeled yarn, costs about Y50 more in producing cost, in the matter of chemicals, etc., whilst, in quality, the output is materially as good as water reeled variety, only the loss amount from refining with soap suds is somewhat larger, it being about as high as ascribed to the water-reeling method.

According to the results of trial sales carried on at the Central Laboratory, it is quite plain that improved plate-reeled yarn may exploit its market easily even at the price of more than Y100 dearer per 100 *kin*, as against small reeled yarn. Moreover, waste silk, a bye-product, too, may be sold to the spinners at Y20-Y30 higher than what is yielded by the small reel method.

Thus it may be seen that the plate reeling method of the Central Laboratory is a very promising one, and that a good deal may be expected also of the water reeling method.

However, a serious drawback of the improved method is that it cannot be operated on a financially feasible basis with larva-stained cocoons and thin tissued ones, which occupy about 25% of the whole cocoon crop. These must be picked out first, either to be sold or, to be dispose of at a Chinese workshop on a small scale to be run conjointly.

This point should engage the attention of those wishing to take up this particular line of industry. Next, experience in the purchase of wild cocoons, ability to manage the Chinese workmen, etc., also form important items in the management of the filature.

If all these items can be covered well, outside the technical matters, the improved filature industry promises to grow into one having a bright future in Manchuria.

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MANCHURIA ENLIGHTENING SOCIETY.

Whose Organ the "Light of Manchuria" is

What actuates us in our endeavours to open up Manchuria and Mongolia lies in realizing our ultimate ideal in the enlightenment and development of Manchuria and Mongolia. It will not do only to develop the natural and industrial resources, but the ethical and intellectual culture of the inhabitants must also be carefully husbanded and nourished, so that both mind and matter may be developed in harmony.

The Manchuria Enlightening Society raised its first cry in order to fill a sorely felt need. Its primary mission is to investigate and propagate the truths of the development of Manchuria and Mongolia. We shall studiously refrain from misleading the public by disseminating inaccurate or exaggerated reports, but shall steadfastly adhere to the truth or facts only.

It is urgently important that the truths regarding Manchuria and Mongolia should be made known clearly not only to Japan and China, but also to Europe and America. On this account, the establishment of the Manchuria Enlightening Society is bound to have a serious significance of international character.

If happily, through the establishment and activity of this Society, the truths of the development of Manchuria and Mongolia should become topics of world wide interest, it would not be only an honour to those now actively engaged in developing these regions, but also a matter of congratulation to the world at argle.

We might be permitted to add that the ultimate ideal and desire of this Society are to serve as the herald of all enlightening movements in future, thereby opening a new chapter in the annals of the world's civilization.

What is the Society Like.

a) Office.—The office of the Society is in the Municipal Office Building on Central Circle in the city of Dairen.

b) Society's Work.—The works of the Society include the following:—

1. Publication of the organ of the Society, The "Light of Manchuria."

2. Supply of general information through the Socitey and by other means, giving the results of such investigations and researches as may be conducted in the interest of the development of natural, industrial, and other resources in Manchuria, Mongolia, and Eastern Siberia.

3. To act as guide to intending investors in general in all kinds of enterprises in Manchuria, etc., and also to undertake any special investigation or research on application by promoters of all kinds.

4. To offer facility to travellers on inspecting visits to Manchuria, Mongolia, Siberia, Chosen (Korea), China, etc., to the end of importing accurate information and rendering their observations as close to truth as possible.

5. To use all kinds of means in order to propagate the true conditions obtaining in Manchuria, etc., and further to carry on the propaganda work for these regions through the medium of lecture meetings, exhibitions, etc.

6. To compile, publish, sell, and distribute books, pamphlets, etc., bearing on Manchuria and Eastern Siberia.

7. To carry on other works necessary for disseminating information on Manchuria, etc., and also for fostering economic enterprises therein.

c) In carrying on the above work, the Society is divided into the following:—

Secretariate,
Research Department,
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Accounting Department.

d) Any one wishing to join the Society is requested to send in a written application, giving the name and address, accompanied with the

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membership fee for not less than three months paid in advance.

e) The membership fee, entitling the member to a copy of the monthly organ, costs 50 sen (½ yen) per month and ¥6 per annum.

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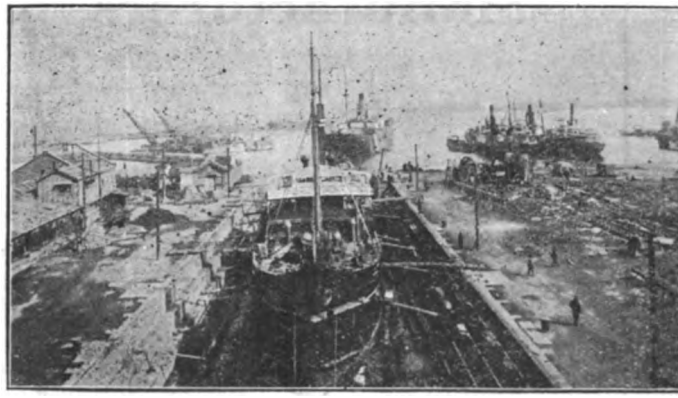

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LIGHT OF MANCHURIA

THE PACIFIC OCEAN AND THE WORLD'S CIVILIZATION.

By Mr. C. Kido,
Superintendent, S. M. R. Co. Geological Institute.

That the Pacific Ocean is the principal theatre of the world's activities in the Twentieth Century is only in the order of things. This point may be looked upon from different angles. For the present purpose, I might be permitted to give my view from a geographical standpoint.

To start with, I shall dwell in brief on the geographical features of the Pacific, comparing it with the Atlantic closely related thereto, before coming to the present situation of the Pacific.

A fable says that the Pacific has been left when what is now the Moon was taken off the earth, but any such an idea is beneath serious notice. The theory that the Pacific Ocean has changed little since the earth's crust got hardened finds much support. Others aver that the Pacific, like the Indian Ocean, have undergone marked changes even in shape and area.

The first discoverers of the Pacific are believed to have been Orientals. But it was perhaps because they could not help it, and cannot be called a discovery.

Of the Occidentals, the first discoverer was in all probability Marco Polo. He visited the Orient as early as 1275 and has left his diary of travels. It is almost certain that he saw at least part of the Pacific.

Columbus, who discovered America, failed to reach the Pacific shore. The first white man who set his eyes on the Pacific on the western shores of the newly discovered Continent of America was Barbosa, the Portuguese. It was in 1513. Seven years later, in 1520, Magellan, another Portuguese, christened the Ocean the Pacific.

The Pacific Ocean takes up 73,125,000 square miles and is almost as large as both the Atlantic and Indian Oceans combined. It is larger than all the land on earth put together by about 8,750,000 square miles. This will enable us to say

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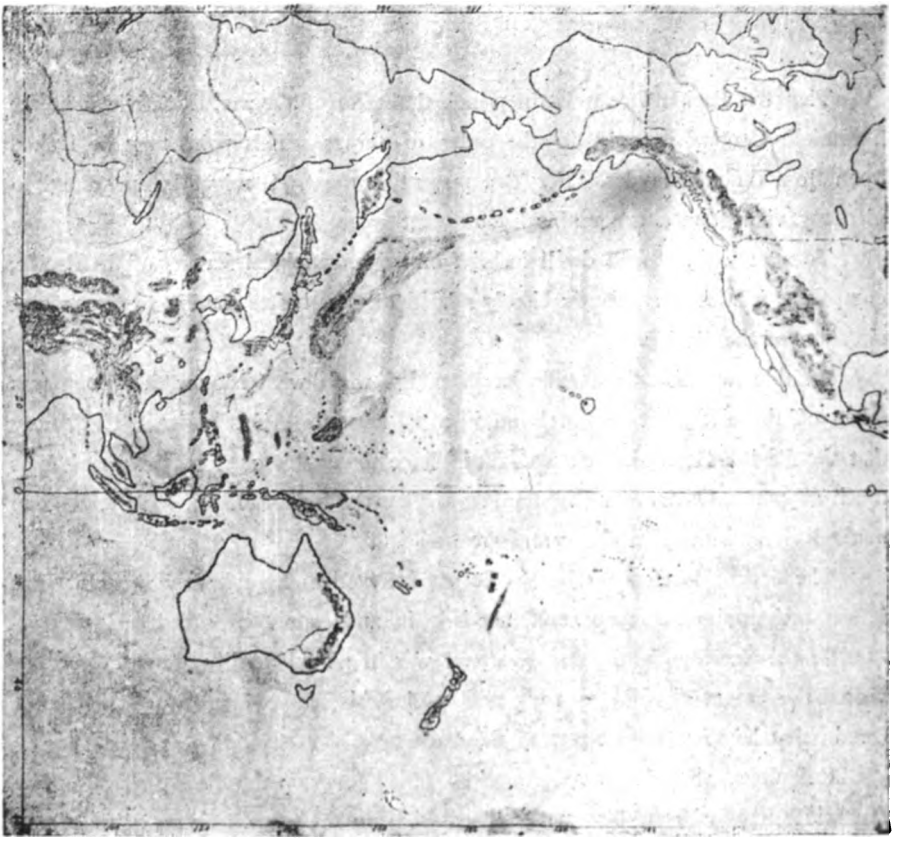
that this mighty Ocean could not be quite filled up even all the land on earth were thrown there into. This Ocean is broadest about the girth of the globe, the Equator. It extends from east to west for 10,000 miles and 9,000 miles from north to south, being more than one third the circumference of the globe around the Equator.



GEOGRAPHICAL MAP

In the Behring Strait on the north, the Pacific is only 36 miles wide. Across this narrow strip of water the Continent of Asia is separated from that of America. But as it goes southward, it broadens on both sides and forms a triangle. South of the Equator, the Ocean tends to narrow, still keeping far apart.

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The Atlantic looks like the letter S in shape, and only from 3,000 to 4,000 miles wide. This facilitates communications across the Atlantic much better.

In point of depth, the Pacific Ocean is 4,100 metres deep on an average, as against 3,860 metres of the Atlantic. One of the characteristics of the Pacific is that it abounds in furrows, which mean the existence of furrows of great depths

OF THE WORLD

in the sea-bed. The furrow at the east of the Philippines has the depth of 9788 metres, the deepest in the whole of the earth. Next comes Mariana Furrow to the southeast of Guam Island. The Tuscarora Furrow at the east of the Japanese Islands is 8513 metres deep.

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As to currents, those of one Ocean are about the same as those of the other.

In the Pacific, the current running on the Equator turns north and is known as the "Black Current." It crosses the North Pacific and tempers the climate of the northwestern parts of the United States of America. It is like the Equatorial Current in the Atlantic developing into the Gulf Stream, to soften the cold of the northwestern Europe.

The boon derived from these currents is larger in the Atlantic.

Immediately before and after the 210th Day (calculated from the beginning of spring by the old lunar calendar, generally early in February), most of the storms that visit the Philippines and the Japanese territory originate at about 5° N. L. south of Guam Island, which belongs to the United States, and between this island and Yap Island under mandate rule of Japan, the deepest furrow above mentioned exists.

The Pacific is thickly dotted with islands, whilst there are much fewer of them in the Atlantic. Another peculiarity is that, whilst the islands in the Atlantic are located in irregular disposition, those in the Pacific, especially such as are scattered near the edge of Asiatic Continent, are mostly arranged regularly in the shape of an arc, embracing bodies of water. For instance, the Aleutian Islands embrace the Behring Sea; the Kuriles do the Okhotsk Sea; the Japanese Festoon does the Sea of Japan; the Loochoos do the Eastern Sea of China; the Philippines do the Southern Sea of China; whilst North and South Islands of New Zealand hug the eastern sea of Australia, lying, as it were, the bulwark to both Asiatic and Australian Continents. Next, the Micronesia, the Hawaiian Islands, etc., lie also scattered regularly in the Pacific. It may be mentioned that the Micronesia consists of such groups as the Marshalls, the Carolines, the Marianas, and the Pelews, which used to belong to Germany, but on the close of the War, passed under Japanese mandate rule. Only, Guam Island alone, situated at the southern extremity of the Mariana Islands, has lain under the United States.

Guam Island is an important strategic point, having coal yards for the Army and Navy, and also as the landing point of the trans Pacific cable line. It is about on the continuation of the straight line drawn from the naval port of San Diego, California, to the military and naval bases in the Hawaiis and the Philippines. Moreover, the Mariana Islands, containing Guam Island, extend from north to

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south, with their northern extremity near the Bonin Islands (Ogasawaras) whence the Seven Islands of Izu Province lie like stepping stones straight north to the Tokyo Bay.

The islands in the Pacific are either volcanic or coral and are of small sizes. Few of them are possessed of an industrial possibility. But, any of them may be raised to one of strategic importance.

Even a low coral islet rising only several feet above the sea level might have a strong strategic significance.

Next, in point of the coast lines, there is a fundamental disparity between the two Oceans. In the Atlantic, the islands are fewer in number, but they have curved coast lines which are comparatively long, considering the areas of the islands themselves. On this account, fine harbours are found everywhere. Quite the reverse is the case with the islands in the Pacific.

On the Asiatic shores, however, border seas are formed by the groups of islands scattered along the coasts, but compared with the Atlantic coasts, the curves are fewer, especially along the American side.

The islands along the eastern fringe of Asiatic Continent extending from Japan proper to the Loochoos, Formosa, and the Philippines, must have marked the eastern coast lines of the continent in ancient times. The present coast lines of the Continent must have been created in consequence of the sinking of the border seas. The former may be called the primary coast lines, and the latter the secondary coast lines.

Simultaneously with the depressions in steps that occurred in parallel with the eastern borders of the Asiatic Continent, ranges of mountains were created. A similar geological phenomenon took place along the coasts of the American Continent. These ranges of mountains run in parallel with the coast lines, with an exception in Central America. Such coast lines are termed geographically the Pacific type, to which the comparative fewness of the curves is ascribed.

On the Atlantic side, the mountains do not run in parallel with the coast lines, and these ranges appear, in some cases, interrupted by the intervention of seas. Moreover on the Atlantic coasts, in many cases, the topographical features of the plateaux extend close to the seacoasts, and these are often divided into plateau masses. Such coast lines are called the Atlantic type.

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Along the Atlantic coasts, in particular, along the European coasts, the mountains run generally from east to west and the coast lines are divided into the possession of many countries, making their unification difficult. Even such as Spain and Portugal are enabled to preserve themselves with the Pyrenees stretching from east to west, forming the bulwark on the north.

On the American side of the Atlantic, there are no mountain ranges running from east to west, facilitating the political unification of the country.

Still another point of divulgence between the Pacific and the Atlantic types is that on the Pacific coasts, the mountain ranges are located near the seacoasts, whilst, on the Atlantic coasts, they are situated farther from the coasts. On this account, the Pacific sides of the Continents slope sharply and have few level plains, whilst on the Atlantic side, the land slopes gently to the shore. Thus, large rivers empty themselves into the Atlantic, and their broad valleys help the dissemination of civilization.

On the Atlantic side of the United States, the Appalachian Range runs almost in parallel with the coast lines, but even this is different from its likes on the Pacific sides in that it forms a sort of an arc in shape. Further, the monutains are not high and do not seriously impede the communications from the seacoasts into the interior.

Whilst on the Pacific sides, volcanoes are found here and there, on the Atlantic sides there are practically none. This adds another point of difference.

The existence of many volcanoes along the Pacific coasts shows the presence of many chasms in the earth's crust. As a natural result, earthquake shocks occur frequently.

Such phenomena exercise an important influence upon the inhabitants, and it must be remembered that the difference in the national characters of the countries on earth owes much to their peculiar natural phenomena.

Next, let us compare the mineral products. The Pacific coasts abound with rocks and mineral deposits created in later ages, whilst, on the Atlantic sides, many of them belong to earlier periods. Whilst the former are rich in mineral ores such as gold, silver, copper, lead, zinc, etc., the Atlantic coasts give plenty of such non-metallic products as coal, petroleum, etc. Iron appears to be almost monopolized by the Atlantic coasts. Still, the iron veins belong to sedimentary deposits, concerning

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which the Pacific sides give only petroleum beds. With even these, most of them are found on the American sides, and few of them on the Asiatic sides.

The great wealth of iron and coal found on the Atlantic sides of both Europe and the United States has proved one of the greatest motive powers to push forward their material civilization.

The United States is moreover rich in petroleum destined to be the strongest lever of civilized activity in the future. On the coasts of the Pacific, in which the United States is apparently planning to operate with concentrated energy, there are the great California petroleum fields. The United States rather painfully feels the comparative dearth of iron and coal on the Pacific coasts, which drawback is redeemed to some extent by the abundance of gold, silver, copper, lead, and zinc.

Even so late as in these latter days, not a steel works stands on the Pacific coasts, and this speaks of their serious disadvantage.

No matter what plentiful supply of petroleum may be available, without the two essential complements of iron and coal, it is impossible to consolidate the foundation of the material civilization of these Coasts, which handicap has to be remedied somehow.

Turning to the Asiatic side of the Pacific, along the Primary Coast Lines, there are only modest hoards of mineral products, the land area being limited. Still, Japan is endowed with a comparative wealth of mineral products, many of the beds having been formed in the younger geological periods. Of the mineral ores, copper occurs in plenty, considering the size of area. However, iron is scarce, and even the Government Steel Works have to depend on China for most of their material. Coal, too, is found in comparative plenty, but is said to be likely to be exhausted in the course of fifty years or so. As to petroleum, the reserve is more limited, and the major portion of the demand has to be imported

Along the Secondary Coast lines, of the Asiatic Continent, extending from China north to Siberia, mining industry is still in its infancy. Indeed there are a few plants in China modernly equipped to work iron and coal mines, but as a whole, their outputs are even less than those of Japan. According to the investigations so far made, the total coal reserves in China are estimated to be second only to those in the United States, but owing to lack of means of rapid communications and other deterrents, most of them still remain unexploited. A similar

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thing may be said of the iron mines. As to other mineral products, no accurate data are yet available. Only from the vast area of her territory, a vague notion is entertained that their wealth must be immense.

The natural resources of Siberia, too, are believed to leave very ample room for energetic exploitation. In fact, Siberia is regarded as just ripe for human tapping. A curious question is, "At whose hands, the subterranean treasury of all this dormant wealth will be unlocked?"

(To be concluded.)

COMPARATIVE STUDY OF JAPANESE AND CHINESE SCHOOL CHILDREN AND INVESTIGATION OF A FEW DISEASES.

By Sanitary Office,
South Manchuria Railway Company.

Preface.

Since the Great War, the whole world has been leavened with the universal reconstruction movement. In this direction, work has already been taken up in many lines. Above all, the improvement of the physical constitution, which forms the very foundation of all human activities, is engrossing the attention of the Western Powers, all anxious to reap a rich practical harvest on their effort.

In Japan, the same need is felt with redoubled force.

It deserves hearty congratulation that recently the attention of the people, high and low, has begun to be turned to the problems of physical culture. Still, few specialists have come forward to take up the same subject from a viewpoint of the racial hygiene.

We, who are directly concerned with the public hygiene in Manchuria, ought not to be contented with the treatment of the ailing, but should go steps farther to make a comparative study of the physical developments and the conditions of health between the Japanese and the Chinese, and in future between the two races and the Russians as well, to the ultimate end of raising the physical standard of the Japanese race.

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Then, as a more practical problem, a question suggests itself for a solution. "Shall the Japanese condition of living, as it stands, be allowed to go on?" Its advantages ought to be fostered, whilst its shortcomings should be remedied. The Chinese and Russian modes of living ought to be studied analytically so as to find what there is worth learning and adopting.

In our opinion, the above study serves not only the good of the Japanese, but has an important significance in realizing the fundamental principle of the Sino-Japanese co-existence and co-prosperity.

Under this belief we plan to begin with the comparison of the developing progress of the Japanese and Chinese school children and the investigation of the diseases that will afflict them. Then, we shall enquire into the causes that bring about the difference in physical constitution. Next, we shall be in a position how to improve the Japanese race.

We shall publish below the results of our initial study.

It may be mentioned that, before comparing the Japanese in Manchuria with the Chinese school children therein, the comparison between the Japanese school children in Manchuria and at home is in order.

I. Developing Progress of Japanese School Children in Manchuria, and Comparison with Japanese School Children in Japan.

The data concerning the physical development of the Japanese school children in Manchuria are based on the showings given at the Primary Schools in the South Manchuria Railway Area for three years from 1919 to 1921, and represent the averages taken from among 23,165 children in all (the same children, when examined twice, being counted as twice the number, and so on).

The data for the Japanese school children at home, with which the above has been compared, represent the statistics of the whole of Japan for the fiscal year 1918.

In making a comparative study on any given subject, care must be taken that the objects of comparison are identically and similarly conditioned, and that both are the most reliable.

We have specially chosen as the object of comparison what has been published by the Department of Education, and in order to make both equally conditioned, the

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figures for the same years ought to have been compared, but as such are not available, to our regret, we have been obliged to choose the latest published up to date.

It may be added in this connection that, as the standard of the physical constitutions of the Japanese school children, what has been based upon the statistics obtained during the fifteen years from 1900 to 1914, is available, but they have been left alone because of the wide gulf of time separating them from the data for Manchuria.

Numbers of Japanese Children in Manchuria Physically Examined. 1919-1921.

Age	Male	Female
7	2,101	1,904
8	1,982	1,861
9	1,815	1,694
10	1,692	1,587
11	1,479	1,44'
12	1,365	1,254
13	937	794
14	684	575
Total	12,055	11,110

Table I.

Comparative Table of Stature.

(*in centimetre*).

Age	In Manchuria male	In Manchuria female	In Manchuria difference	In Japan male	In Japan female	In Japan difference	Those in Manchuria compared with those in Japan male	Those in Manchuria compared with those in Japan female
7	108.2	107.3	0.9	107.8	106.5	1.3	0.4	0.8
8	112.7	112.1	0.6	112.7	111.0	1.7	—	1.1
9	118.5	116.1	2.4	117.2	116.0	1.2	1.3	0.1
10	122.7	122.4	0.3	121.7	120.6	1.1	1.0	1.8
11	129.4	125.8	3.6	126.3	124.1	2.2	3.1	1.7
12	131.2	130.3	0.9	132.0	134.3	●2.3	△0.8	△4.0
13	134.5	137.9	●3.4	136.4	136.9	●0.5	△1.9	1.0
14	138.5	143.3	●4.8	143.6	141.1	2.5	△5.1	2.2

● Indicates superiority of females to males.

△ " " " those in Japan to those in Manchuria.

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Table II.

Comparative Table of Weight.

(in kilogramme).

Age	In Manchuria male	In Manchuria female	In Manchuria difference	In Japan male	In Japan female	In Japan difference	Those in Manchuria compared with Those in Japan male	Those in Manchuria compared with Those in Japan female
7	17.9	17.0	0.9	17.8	16.9	0.9	0.1	0.1
8	19.4	18.7	0.7	19.3	18.6	0.7	0.1	0.1
9	21.7	20.4	1.3	21.1	20.2	0.9	0.6	0.2
10	23.3	22.7	0.6	23.6	22.2	1.4	△0.3	0.5
11	26.1	24.8	1.3	26.1	23.4	2.7	—	1.4
12	28.1	27.8	0.3	27.9	26.4	1.5	0.2	0.2
13	33.4	31.8	○1.4	33.7	32.0	○1.3	△0.3	△0.2
14	33.9	35.5	○1.6	33.6	34.6	○1.0	0.3	0.9

○ Indicates superiority of females to males.

△ „ „ „ those in Japan to those in Manchuria.

Table III.

Comparative Table of Bust.

(in centimetre).

Age	In Manchuria male	In Manchuria female	In Manchuria difference	In Japan male	In Japan female	In Japan difference	Those in Manchuria compared with Those in Japan male	Those in Manchuria compared with Those in Japan female
7	54.2	52.4	1.8	54.2	52.4	1.8	—	—
8	50.1	54.2	1.9	56.4	51.2	2.2	△3	—
9	58.2	55.2	3.0	58.2	55.2	3.0	—	—
10	59.2	58.2	1.0	60.3	58.2	2.1	△1.1	—
11	62.4	59.4	3.0	62.1	60.0	2.1	0.3	△0.6
12	63.6	61.5	2.1	63.9	62.1	1.8	△0.3	△0.6
13	66.1	64.2	1.9	66.4	65.2	1.2	△0.3	△1.0
14	67.6	69.1	○1.5	68.8	68.5	0.3	△1.2	0.6

From the above tables, it is seen that firstly in point of stature, the male children in Manchuria beat their brother children in Japan between 7 and 11 in age, at the rate of 0.4 to 3.1 or 1.2 centimetre on an average, except at the age of 8 the figures stand the same, whilst others above 12 years old, inclusive, give a

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far poorer showing. As regards others of over 12 years, the former are the poorer by the average of 2.6 centimetres.

Thus, the Manchurian children, who have grown faster than their brother children of the same ages in Japan from 7 to 11 years of age, are found to lag behind the latter once above twelve years of age at the average rate of 2.6 centimetres. This is a point worth studying.

School Children from the interior to take part in Interschool Field Sports.

In the Western Countries, among children of both sexes, those between 8 and 10 years of age are in the second filling stage, whilst the ages from 11 to 15 make the second lengthening stage.

With the Japanese children of the same ages at home, the distinction between the above two stages is not at all clear. Turning to the Japanese children of the S. M. R. Co. Primary Schools along the South Manchuria Railways, the order of the two stages seems reversed. If such can be actually established, it will form a very interesting question, and will call for further attention in the same direction.

The female children are, on the whole, much taller than those at home. That at the age of 13 those in Manchuria suddenly fall behind others at home should

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not be put down to the slower growth of those in Manchuria, but to the fact that the children at home have already entered the stage of growth preceding puberty.

Comparing male children with female ones, between the ages of 7 and 11 at home, the males lead; but the females take precedence between 12 and 13 years. Among the school children in Manchuria, up to 12 years of age, males are in the lead, whilst the order is reversed between 13 and 14 years. This shows that the growth preceding puberty comes to the female children in Manchuria a year later than to those in Japan.

A similar phenomenon is observed among the German female children at the age of 11, and with the Chinese female children at the age of 14. The cause of these variations invite investigation.

Secondly, in respect of weight, as may be seen from Table II, both children at home and in Manchuria place the males above the females between 7 and 12 years of age, but the females come before the males between 13 and 14 years. However, the margins between the sexes up to 12 years of age are not varying. The difference in the boys' favour in Manchuria ranges from 0.3 to 1.3 kilogramme with the average of 0.9 kilogramme, whilst in the case of those at home, the difference stands from 0.7 to 2.7 kilogrammes with the average of 1.4 kilogrammes also in the boys' favour. The greatest difference is observed between 10 and 12 years of age. This difference should be more accurately ascribed to the light weight of girl-children at home between 10 and 12 years of age, than to the heavier weight of the boy-children at home.

Next, comparing the children at home and in Manchuria, the latter beat the former in most cases. This superiority is more marked with the girl children. With the boys, the difference in favour of those in Manchuria is only 0.1 kilogramme for each age; but with the girls, this difference goes up to 0.6 kilogramme. The ages, at which the same difference is most pronounced, are between 11 and 12, and this has just been explained.

In short, in respect of weight, the children of both sexes in Manchuria are in the lead, and the girls have greater odds in their favour.

Thirdly, with regard to bust, as may be seen from Table III, in both Japan and Manchuria, the boys beat the girls of the same ages, the difference being

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nearly uniform, and the average differences for all the ages are 1.8 centimetres and 1.7 centimetres for those in Japan and Manchuria respectively.

Only in Manchuria, girls at 14 years beat boys, which difference is not observed in Japan.

Next, comparing the children in Manchuria with those in Japan, the odds are in the latter's favour, although only in a trifling measure.

To be more exact, speaking of boys, there is no difference between the ages from 7 to 9. At 11 years, the difference in favour of those in Japan is 0.3 centimetre, and at the older ages, it is from 0.3 to 1.2 centimetre, the average being 0.4 centimetre. Next, talking of girls, no difference is noted between 7 and 10 years. From 10 up to 13, the difference amounts to from 0.6 to 1.0 centimetre, but at the age of 14, the margin goes up to 0.6 centimetre, the average for all the ages being 0.2 centimetre.

From the above statistics, we have deduced the following:—

1. With boys, those in Manchuria are ahead of those at home between 7 and 11 years of age, but once above 12 years, the rate of growth suddenly comes down and falls considerably behind the latter.
2. With girls, the odds are in favour of those in Manchuria at each age, except at 13, at which those at home grow faster just prior to puberty.
3. The fast growth preceding puberty is observed among the girls at home between 12 and 13 years, whilst among those in Manchuria, the same stage is reached a year later.
4. In weight, the children of both sexes in Manchuria beat those at home, especially in the case of girls between 11 and 12 years of age.
5. In point of bust, the children in Manchuria are but triflingly below.

II. Physical Development of Chinese School Children and Their Comparison with Japanese School Children in Manchuria.

The investigation of the physical development of the Chinese school children like that of the Japanese children, is based on the results of the examinations conducted at the Primary Schools in the South Manchuria Railway Area in 1919, 1920, and 1921.

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The data given in those tables are the means taken of altogether 3,012 children for the above mentioned three years.

The figures are much lower than those for the Japanese children in Manchuria who were similarly examined, and leave some thing to be desired as statistics for comparison, but as matters then stood, the Chinese children were in only a small number, and no other data were available.

Numbers of Chinese Primary School Children Physically Examined. 1919-1921.

Age	Male	Female
7	29	4
8	79	25
9	222	61
10	290	67
11	365	64
12	427	50
13	457	47
14	431	35
15	337	22
Total	2,637	375

Table I.

Comparative Table of Stature.

(in Centimetres).

Age	Chinese Children			Japanese Children			Chinese Children compared with Japanese Children	
	male	female	difference	male	female	difference	male	female
7	110.6	108.8	1.8	108.2	107.3	0.9	△2.4	△1.5
8	114.5	112.4	2.1	112.7	112.1	0.6	△1.8	△0.3
9	117.0	116.1	0.9	118.5	116.1	2.4	1.5	—
10	122.4	120.9	1.5	122.7	122.4	0.3	0.3	1.5
11	125.5	125.5	—	120.4	125.8	3.6	3.9	0.3
12	133.0	130.0	3.0	131.2	130.3	0.9	△1.8	0.3
13	134.2	134.2	—	134.5	137.9	○3.4	0.3	0.6
14	139.1	140.6	○1.5	138.5	143.3	○4.8	△0.6	2.7
15	143.0	144.8	○1.8					

○ Indicates superiority of females to males.
△ „ „ „ Chinese to Japanese.

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Table II.

Comparative Table of Weight.

(in Kilogramme).

Age	Chinese Children male	Chinese Children female	Chinese Children difference	Japanese Children male	Japanese Children female	Japanese Children difference	Chinese Children compared with Japanese Children male	Chinese Children compared with Japanese Children female
7	18.1	16.6	1.5	17.9	17.0	0.9	△0.2	0.4
8	19.0	19.7	○0.7	19.4	18.7	0.7	0.4	1.0
9	20.7	19.8	0.9	21.7	20.4	1.3	1.0	0.6
10	22.8	22.4	0.4	23.3	22.7	0.6	0.5	0.3
11	24.5	24.7	○0.2	26.1	24.8	1.3	1.6	0.1
12	26.3	26.8	○0.5	28.1	27.8	0.3	1.8	1.0
13	28.8	28.7	0.1	30.4	31.8	●1.4	1.6	3.1
14	31.0	32.8	●1.8	33.9	35.5	●1.6	2.9	2.8
15	33.2	37.5	●4.3					

Table III.

Comparative Table of Bust.

(in Centimetre).

Age	Chinese Children male	Chinese Children female	Chinese Children difference	Japanese Children male	Japanese Children female	Japanese Children difference	Chinese Children compared with Japanese Children male	Chinese Children compared with Japanese Children female
7	55.1	52.7	2.4	54.2	52.4	1.8	△0.9	△0.3
8	55.8	55.1	0.7	56.1	54.2	1.9	△0.3	△0.9
9	57.1	55.8	1.3	58.2	55.2	3.0	1.1	△0.6
10	59.4	56.7	2.7	59.2	58.2	1.0	0.2	1.5
11	60.6	58.8	1.8	62.4	59.4	3.0	1.8	0.6
12	62.7	59.7	3.0	63.6	61.5	2.1	0.6	1.8
13	63.4	62.1	1.3	66.1	64.2	1.9	2.7	2.1
14	65.2	65.2	—	67.6	69.1	●1.5	3.9	3.9
15	67.0	67.3	○0.3					

Firstly, in regard to stature, the difference between the Chinese boys and girls is in the former's favour, the same as in the case of the Japanese children. The only divergency is that among the Japanese children, the girls have outstripped the boys at the age of 13, whilst with the Chinese children, boys and girls are found the same at the age of 13, and at the ages of 14 and 15, the latter beats the former by 1.8 to 1.5 centimetres.

This indicates that puberty comes later to the Chinese girls than to their Japanese sisters.

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Next, compared with the Japanese children, in stature, the Chinese boys beat their Japanese brothers by only a slight margin. To be more particular, at the ages of 7, 8, 12, and 14, the Chinese lead, but at the ages of 9, 10, 11, and 13, they lag behind, the mean advantage they have being only 0.3 centimetre, which, if distributed to the different ages, make only 0.04 centimetre.

Speaking of the Chinese girls, they compare very unfavorably with their Japanese sisters. It is true that the odds are in their favour at the ages of 7 and 8 only, but those above ten years are all shorter, to the extent of 5.4 centimetres, which, distributed to the different ages, makes 0.7 centimetre.

Secondly, with regard to weight, between Chinese boys and girls, more or less superiority and inferiority are noticed from 7 to 13 years of age, although in more cases the former excel the latter. At the ages of 14 and 15, on the contrary, the boys show far better than the girls.

School Children arriving at Hsiangyocheng Hot Springs in donkey cars.

Then comparing the Chinese with the Japanese, the one are slightly better than the other at the respective ages of 7 and 8 of males and females. However, at the older ages, the Chinese, irrespective of the sex, are markedly at a disadvantage to

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the Japanese. This difference becomes most accentuated as the age goes higher, as in the case of the Chinese girls in point of stature.

Thirdly, let us talk of bust. As the case is with the Japanese, the boys are in the lead from 7 to 13 years of age, the differences, too, being about identical with those of the Japanese.

Compared with the Japanese, the Chinese give a better showing by 0.3 to 0.9 centimetre at the age of 7 of boys and at the ages of 7-9 years of girls. At the other ages, however, the Chines give a poorer showing, the odds growing greater as the age goes higher, similarly to weight.

In short, the Chinese children are better than the Japanese children up to the age of 8, the tables being turned against the former from the age of 9 upwards. The difference grows striking by the ages of 13-14. On the contrary, in stature, the Chinese boys are slightly taller than the Japanese. The above suggests that a larger percentage of the Chinese older children is inclined to be lean but tall.

Next, the charts showing the comparative development of the Japanese school children in Manchuria and Japan and the Chinese children in Manchuria are attached elsewhere.

III. Monthly Sick Returns of Japanese School Children in Manchuria.

Children, as a rule, are more susceptible to illness in some of the months than in the others. Dr. Burgerstein, as a result of investigations of 40,000 boys and girls up to the age of 14 at Vienna, has announced that the rate of illness gradually rises from September, in which month the school term opens up to December, and that April is the worst month.

Next, Dr. Inaba, of Tokyo, has published that children's sick cases appear in the largest number in December, January, and February followed by April and May. Different climates plainly cause a variation in the sick rate of children. Evidently the weather conditions of the different months and other factors produce divers effects on the children, and needless to say, they have a very close relation to the growth of children.

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The following table shows what were the causes of absence from school on the part of the Japanese school children for a year from April, 1920.

	April	May	June	July	August	September	October
On School Roll	8,788	8,891	8,014	8,305	8,234	8,403	8,310
Headache	20	29	48	32	13	25	19
Nervous diseases	3	6	3	3	5	5	5
Cold	301	234	174	97	48	152	175
Disorders of respiratory organ	19	35	46	29	15	27	38
Stomach ache	15	24	39	27	12	21	10
Disorders of digestive organ	12	29	57	47	28	28	22
Eye diseases	27	32	31	15	13	23	23
Ear diseases	9	10	11	4	2	7	10
Skin diseases	28	23	27	11	8	18	26
Specified infectious diseases	9	12	20	22	30	58	64
Tuberculosis	1	1	1	1	—	1	1
Measles...	41	118	37	7	2	2	—
Whooping cough	—	2	7	14	6	6	5
Other diseases	18	40	38	28	20	35	25
Total	503	505	539	339	214	408	434
Percentage to all children	5.72	6.69	6.26	4.05	2.60	4.86	5.22

	November	December	January	February	March	Total	Percentage to all children
On School Roll	8,324	8,247	8,237	8,237	7,080	100,036	—
Headache	16	7	8	6	11	233	0.23
Nervous diseases	5	5	6	9	4	59	0.06
Cold	289	762	238	194	202	2,846	2.82
Disorders of respiratory organ	37	30	25	31	28	300	0.35
Stomach ache	6	3	9	8	7	187	0.18
Disorders of digestive organ	11	7	12	14	12	270	0.27
Eye diseases	14	10	5	7	5	205	0.20
Ear diseases	11	15	4	12	14	115	0.11
Skin diseases	19	21	12	14	7	217	0.21
Specified infectious diseases	57	36	16	23	20	373	0.36
Tuberculosis	—	—	1	0	1	7	0.01
Measles...	1	—	2	10	20	252	0.25
Whooping cough	3	1	1	1	—	46	0.04
Other diseases	38	33	21	22	22	346	0.34
Total	483	934	360	357	359	5,525	
Percentage to all children	5.80	11.33	4.37	4.30	4.50	—	5.49

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To altogether 100,263 Japanese school children in Manchuria for one year (one child counted as twelve the same as the number of the months), the total number of the sick cases was 5,525 or 5.52%.

This sick percentage (5.52%) being indicative also of the average monthly rate, the different months may be compared with the same average.

Firstly, the first three months of the year—January, February, and March produced a comparatively fewer number and were each below the average. The number gradually increased from April, surpassing the average. To be more exact, the quotas for May and June went above 6%. A slight decrease was observed in the July, the decrease becoming more pronounced in August. A word ought to be put in this connection. The summer vacation lasting throughout the month of August, the investigations were necessarily incomplete, suggesting that the actual number of the sick cases were more likely to be larger. The figures for September were, like those for January, February and March, smaller and below the average. A gradual increase was shown in the figures for October and further on, until they were the highest in December, being 11.33%, which is twice the average.

Secondly, looking into the relation of the different months to the kinds of diseases, cold tolled the largest number of victims in December, and the smallest number in July and August; disorders of the digestive organ produced the largest number of victims in June and July and the smallest number in November and December; for the specified infectious diseases, September, October, and November polled the highest number of victims, and April, May, and June, the smallest number; measles gave the highest number in May, but few victims in October, November, and December; July was the worst month for whooping cough, but both March and April were clean months, there being only one victim in December, January, and February.

According to the report of Dr. Charles Bellman, New York City, cases of measles were most in May, April, and March, being fewest in September, October, and August; March, May, and January were the worst months for whooping cough, the three months of October, November, and August being the reverse.

A comparison of these figures will show that the variation in the number of the sick cases nearly coincides with those at New York City. Only, in both

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increase and decrease, New York City is one or two months in advance of Manchuria. But this point of difference may be ascribed to the difference in climate.

Supposing that the variation of the sick rate according to the months and the monthly variation of the sick rate according to kinds of diseases are influenced by the climatic and other peculiar conditions, it is equally possible that a like variation may be observed in a more or less measure also in Manchuria according to the climatic difference, and on this hypothetic assumption, the following observation has been made with one or two kinds of diseases considered as most susceptible to the climatic influences according to the difference in latitudes:—

Yearly Sick Rate according to Different Latitudes).

		Pulmonary trouble	Disorders of digestive organ
Section I	Number of sick cases	1,210	107
	Percentage	43·07	5·09
Section II	Number of sick cases	1,530	221
	Percentage	33·00	4·77
Section III	Number of sick cases	454	78
	Percentage	33·75	5·75

Remarks: Section I extends between 39° 30′ and 40° N.L. and includes Wafangtien, Hsiungyocheng, Tashihchiao, Haicheng, Anshan, Antung, Chikuanshan, and Lienshankuan.

Section II extends from 41° to 42° 30′ N.L., including Liaoyang, Fengtien, (Mukden), Fushun, Tiehling, Penchihu, Chiaotou, and Yungantai (Fushun).

Section III runs between 42° 30′ and 44° 30′, comprising Kaiyuan, Changtu, Ssupingkai, Kungchuling, Changchun, and Chenghiatun.

As indicated above, the sick rate for the one year referred to from both pulmonary trouble and disorders of the digestive organ was the highest in Section I situated in the lower latitudes where the difference between the extremes of cold and heat is comparatively small. As it goes farther north, in Section III, where the difference between the two extremes is the widest, the sick rate is found lower, quite contrary to our expectations.

However, the above is the returns for only one year, and it can scarcely be accepted as a reliable annual standard. Still it certainly gives food for future

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thought as regards the real effect, if any, of the difference in latitude upon the physical development of the school children, so that a more dependable conclusion may be deduced on this interesting point.

IV. Trachoma and Japanese and Chinese Children in South Manchuria.

Trachoma is often referred to as a national disease and sometimes as a school disease. In each school, this malady finds a good number of victims.

The South Manchuria Railway Company asked Dr. S. Kitamura (Superintendent, the Ophthalmological Division, the Dairen Railway Hospital) as early as 1910 to inspect the trachoma situation, as it stood, at the Primary Schools along the Railway Lines and experimented upon several preventive plans, reaping tolerable results.

Again, in 1917, Dr. C. Oguchi (the oculist of as great distinction as Dr. Kitamura), a professor of the South Manchuria Medical College, Fengtien (Mukden), and Dr. S. Mori (Dr. Kitamura's successor at the Dairen Railway Hospital) were desired by the Railway Company to investigate the subsequent developments possible.

of the epidemic at the Primary Schools to the end of exterminating it, if

In August, 1918, oculists were attached to the Company's Sanitary Office, to be sent out occasionally on a professional tour of such schools as are not provided with eye-specialists. This arrangement, too, gave suitable results.

The following table describes the progress of this particular epidemic since October, 1918, as it was shown by the quarterly inspections conducted each year:—

Total	1918		1919		1920		Average
Average	19.04		16.96		15.18		16.79
October	21.03	April	19.20	April	16.28		
December... ...	17.35	July	18.00	July	14.38		
		October	18.34	October	17.05		
		December	12.31	December	13.01		16.79

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As indicated in the above table, the patients vary in number according to the difference in months in which the periodical inspection was made, but on the whole, a decreasing tendency is observed. For instance, the average of 19.67% in 1918 decreased to 16.96%, and further to 16.79% in 1920.

It also appears that the climatic influences have something to do with the rampancy and abatement of the epidemic. The months of April and October produced the largest quotas and the months of July and December the smallest.

In order to look into the relation between the fresh cases and the cases cured of trachoma, the average of three years is given under, from the returns of the quarterly examinations at the Primary Schools:—

	Fresh cases		Cases cured	
	(A) % for each quarterly term	(B) total % of each quarterly term	(A) % for each quarterly term	(B) total % of each quarterly term
Wafangtien	14.21	127.89	12.66	113.94
Hsiungyocheng	7.04	63.36	6.53	58.77
Tashihchiao	4.97	4.73	5.68	51.12
Haicheng	3.20	28.80	3.77	33.93
Anshan	8.00	72.54	8.71	78.39
Liaoyang	6.09	54.81	10.59	95.31
Fengtien (Mukden)	5.06	53.04	5.01	45.09
Within walls of Mukden ...	6.54	58.86	4.50	40.50
Tiehling	8.41	75.69	8.61	77.49
Kaiyuan	8.04	80.46	17.57	158.13
Changtu	4.96	44.64	7.44	66.96
Ssupingkai	9.34	84.06	7.09	63.81
Kungchuling	4.21	37.89	4.63	41.67
Changchun	7.37	66.33	8.05	72.45
Penchihu	7.06	63.54	6.89	62.01
Chiaotou	6.62	59.58	7.91	71.19
Lienshankuan	9.31	83.79	11.65	108.85
Chikuanshan	7.46	67.14	9.61	81.49
Antung	4.07	36.63	5.19	49.71
Fushun	7.59	68.31	8.30	74.70
Average	6.79	61.11	7.48	67.32

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	B ∓ A	(B) ∓ (B)	Children on school rolls (average for each term)
Wafangtien	1.55	13 95	258
Hsiungyocheng	0.51	4.59	69
Tashihchiao	△ 0.71	△ 6.39	264
Haicheng	0.57	△ 5.13	65
Anshan	△ 0.65	△ 5.85	485
Liaoyang	△ 4.50	△ 40.50	467
Fengtien (Mukden)...	0 95	8.55	1,264
Within walls of Mukden	2.04	18 36	82
Tiehling	△ 0.20	△ 1.80	330
Kaiyuan	△ 8.36	△ 77.57	151
Changtu	△ 2 48	△ 22.32	54
Ssupingkai	2 25	20.25	168
Kungchuling	△ 0.42	△ 3.78	267
Changchun	0.68	6.12	540
Penchihu	0.17	1.53	321
Chiaotou	△ 1.29	△ 11.61	52
Lienshankuan	△ 2.34	△ 21.06	101
Chikuanshan	△ 2.15	△ 19.35	130
Antung	△ 1.12	△ 10.08	906
Fushun	△ 0.71	△ 6.39	1,306
Average	△ 0.69	△ 6.21	7,467

Remarks: △ indicates decrease.

The difference between all the cases of the previous term and the cases other than fresh for the term is counted as "cured." There may have been a few who were not cured, but, the number being small, they are not excluded.

It is to be hoped that the number of the fresh cases will be small and that of the cured will be larger. If the reverse should be the case, it indicates the spread of the epidemic. If the number of the fresh cases is still smaller and that of the cured is still larger, it will show that the cure has been more efficacious and the preventive measures have reaped fine result.

All these relations are traceable in the above table.

Speaking of the total average of all the Primary Schools, to 6 79% of the fresh cases, the cured amounted to 7.48%, being a decrease by 0.69%. All throughout the two years and two months, the fresh cases amounted to 61.11%, and the cured, to 67.32%, being a decrease by 6.21%.

The above returns suggest that the cure and prevention of the epidemic are quite effective.

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Effort will be used for the extermination of the disease.

The trachoma victims among the Japanese and Chinese school children, compared with those among the Japanese children at home, are as indicated in the following table :—

Number of		In Manchuria: Japanese children	In Manchuria: Chinese children	In Japan: Japanese children In fiscal year 1918
Children examined	male	4,403	1,263	
	female	3,890	134	
Victims	male	704	258	15.56%
	female	684	46	17.30%
Percentage...		16.54%	24.51%	16.48%

As indicated in the above table, the average percentage of the children victims, inclusive of both sexes, is 16.48%, according to the returns of the fiscal year 1918. The number of victims among the Japanese children in Manchuria in the same year was 3.19% larger; that in 1919 was 0.48% larger; that in 1920, 0.31% larger, and that in 1921, 0.06% larger. Thus, the figure for Manchuria for 1921 was only almost as large as that for Japan in 1918.

School Children's Colony at Hsiungyocheng, taking gymnastic exercise.

Turning to Japan, the sick rate varies according to the Prefectures, and, from the announcement made by the Ministry of Education, the smallest quotas were

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contributed in 1918 by Tokyo Prefecture and Shiga Prefecture at the respective ratios of 4.45% and 5.56%, whilst the highest quotas were given by Aomori and Ohita Prefectures at the respective ratios of 32.31% and 34.58% respectively.

It is held as interesting questions to see with what Prefectures in Japan the school children in South Manchuria may be compared, and further to look into the sick rates attributed to different points in South Manchuria in order to institute a comparative study of these figures.

Next, comparing the Japanese children of both sexes with the Chinese children, the ratio is found to be 16.54% to 24.51%, the latter being larger than the former by almost 50%.

These odds against the Chinese children are confirmed also by the returns prepared by Dr. Oguchi (of the South Manchuria Medical College, Mukden) and Dr. Mori (of the Dairen Railway Hospital) in 1917, which follow:—

	Children	Returns by Dr Oguchi	Dr. Mori
Trachoma	Japanese	21.5%	22.6%
	Chinese	34.8%	28.8%
Suspect trachoma...	Japanese	9.0%	2.3%
	Chinese	11.4%	0.2%

V. Near-sightedness of Japanese and Chinese School Children in South Manchuria.

Investigations of ocular disorders such as Long-sightedness, Astigmatism, etc.

All disorders of the eye, such as short sightedness, etc., often impede the progress of the school work of their victims, and moreover cause no small amount of inconvenience and other disadvantage in life.

Especially, short-sightedness is the most serious disorder, and the tendency of a gradual increase, as noted year after year, gives cause for alarm.

The returns published by the Ministry of Education, Tokyo, in connection with the middle schools in Japan, the national average percentage of short-

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sightedness in 1913 was 15.98%; in 1915, 18.95%; in 1918, 22.03%, showing a gradual increase.

This disorder apparently grows more pronounced as the students rise to the higher schools.

The average rate for the middle school boys in 1918 was 22.03%; that for the medical college students, 40.12%; and that for the Imperial Universities, 52.54%.

The returns for cases of short sightedness among the Primary School children in the South Manchuria Railway Area above the fifth year grade, in April, 1921, are as below:—

	Children examined		Cases of short sightedness		Percentage	
	males	females	males	females	males	females
Anshan	112	108	14	22	12.50	20.37
Liaoyang	116	93	10	27	8.62	29.03
Fengtien (Mukden) ...	253	220	71	79	31.81	35.91
Changchun	132	104	41	43	31.06	41.35
Pushun	205	174	34	30	16.59	17.24
Antung	226	201	35	51	15.49	25.04
Others	605	549	99	115	16.53	20.95
Total	1,629	1,449	304	368	18.66	25.40

Remarks: The schools which had less than 100 children were put under the head of "Others."

The above will indicate that the percentage of short sightedness widely varies among the schools and also between the sexes, but the averages of all the schools are 18.66% for the boys and 25.40% for the girls, the rate for the latter exceeding the former's by just slightly below 40%.

Compared with school children in Japan, according to statistics taken of the school children at the city of Kanazawa in Ishikawa Prefecture, the rates were 10.07% and 13.53% for boys and girls respectively.

In the absence of other reliable data of the kind, it would be too hasty to adopt the above figures for the purpose of comparison with the data for Manchuria.

But, when we find that, in contrast to 22.03% for the middle school boys in 1918, the percentage for the Girl's High School students was 14.85%, and further considering that, in the normal schools, the relative data for boy and girl students

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were 27.06% and 16.45% respectively, the above mentioned rates for the school children in South Manchuria seem rather high.

Chinese Children.

Turning to the Chinese children, the data taken in April, 1921, show that, of 557 of them examined, 43 (or 7.72%) was found affected more or less with short-sightedness.

School Children's Colony at Hsiungyocheng Hot Springs.

If the percentage for the Chinese children is really so low as the above, its causes ought to be carefully looked into.

The examination conducted at the Yingkou Business School, out of 140 students between 14 and 22 years of age, 20 (or 14.28%) were short-sighted.

With regard to long-sightedness and astigmatism, too, their returns were obtained in April, 1921, simultaneously as the examination for short-sightedness was held. The results showed that, out of altogether twenty-four schools along the South Manchuria Railway Lines, cases of long-sightedness were discovered at Fengtien (Mukden) and Anshan only. Next, cases of astigmatism and other ocular disorders were found at the schools at Fengtien (Mukden) and eight other schools.

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The percentages were 0.53% and 1.04% for boys and girls respectively in the case of long-sightedness, and 2.58% and 1.66% in the case of astigmatism, etc.

Then, talking of the Chinese children, not a case of long-sightedness was met with among the Chinese children, and, as to astigmatism, etc., there was only 0.9% among the boys, when examined at the same time as short-sightedness.

Table for Long-Sightedness, etc.

The following table gives the returns for long sightedness, astigmatism, etc., in the Primary Schools in the S. M. Railway Area:—

	Actual number of Long-sightedness		Percentage		Actual number of Astigmatism		Percentage	
	male	female	male	female	male	female	male	female
Taslubchiao	—	—	—	—	2	—	4.17	—
Anshan	3	1	3.68	0.93	4	—	3.57	—
Liaoyang	—	—	—	—	1	—	0.86	—
Fengtien (Mukden)	6	14	2.58	6.30	22	9	9.44	4.09
Within walls of Mukden ...	—	—	—	—	—	1	—	4.25
Saupingkai	—	—	—	—	1	—	3.33	—
Kungchuling	—	—	—	—	2	2	3.33	4.76
Fushun	—	—	—	—	—	1	—	0.57
Antung	—	—	—	—	10	11	4.42	5.47
Total	9	15	0.53	1.04	42	24	2.58	1.66

Remarks: The number of the children was the same as mentioned in the table for short-sightedness.

The schools without a case of either long-sightedness or astigmatism are not mentioned.

VI. Defective Hearing of Japanese School Children in South Manchuria.

Defective hearing has as serious an effect on both class work and hygienic welfare as short-sightedness. Therefore, at the time of the revision of the regulations for the physical examination of the school children in 1921, this item of defective hearing was added, the returns therefor being as follow:—

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	Actual number of cases of hard hearing		Children examined		Percentage	
	male	female	male	female	male	female
Tashihchiao...	6	—	48	52	12.50	—
Anshan	—	1	112	108	—	0.92
Haicheng	—	1	13	9	—	11.11
Liaoyang	1	—	116	93	0.96	—
Fengtien (Mukden)	4	1	233	220	1.72	0.45
Tiehling	3	—	78	67	3.85	—
Kaiyuan	1	—	32	27	3.13	—
Ssupingkai	—	3	30	25	—	12.00
Kungchuling	1	—	60	42	1.67	—
Changchun	36	30	132	104	27.27	28.84
Kirin	—	3	11	5	—	20.00
Penchihu	—	4	81	53	—	7.55
Fushun...	1	1	205	174	0.49	0.58
Yungantai (Fushun)	1	—	84	74	1.19	—
Antung	18	11	226	201	7.96	5.47
Harbin	5	—	20	33	26.00	—
Elsewhere	—	—	148	752	—	—
Total	77	55	1,629	1,449	4.73	3.80

Remarks: None of the schools at Wafangtien, Hsiungyocheng, within the walls of Fengtien (Mukden), Changtu, Chiaotou, Lienshankuan, Chikuanshan, and Chengchiatun had any one afflicted with defective hearing.

In addition to the above mentioned seven schools, which had none hard of hearing, there were a number of schools, in which either of the sexes was free from the same affliction.

The percentages of those afflicted range, with boys, from 0.49% of Fushun and 0.96% of Liaoyang to 27.27% of Changchun and 25.00% of Harbin, whilst, with girls, they are from 0.45% of Fengtien (Mukden) and 0.58 of Fushun to 28.84% of Changchun.

Then, the total average of the whole of the children examined is 4.73% for boys and 3.80% for girls.

Dr. Bezold, the celebrated authority on otology in Germany, is reported to have discovered 25.8% of children hard of hearing by an examination conducted in whispers over the school children. By the side of these statistics, the quota for the Japanese children in Manchuria is incomparably low.

The results of investigation by Dr. Y. Wada (ex-Superintendent of the Rhino-Laryngo-Otological Division of the Dairen Railway Hospital) at the Primary

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Schools along the S. M. R. Lines in 1918 put the children hard of hearing at 15.3% for boys and 12.5% for girls, which percentages are decidedly higher than their predecessors, although still only less by about 50% than the German statistics.

As there are no statistics yet published about the children in Japan, a comparison with them has to be reserved.

VII. Colour Blindness of Japanese and Chinese School Children.

Among cases of colour blindness, there are total colour-blindness and partial colour-blindness. Any one afflicted with the former can distingnish only black and white, whilst those cursed with the latter can see yellow and blue in addition, but both red and green appear to them grey.

The imperfect development of the colour perception will bring about total colour weakness or partial colour weakness. And there are only few cases of total colour blindness and total colour weakness.

Skating Contest at Mukden, Jan. 23, 1921.

Colour blindness is a priori abnormality and its cause is unknown. Cases of colour blindness are not at all few. According to the statistical returns,

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4 or 5% of the males is colour blind, whilst, with the females, their number is even less than one-tenth. Such as are afflicted with this abnormality mistake red and green for grey, and this leads to sundry obstacles in the class work. Moreover, the occupation to be adopted after completing the school course ought to be selected with good judgment. Many callings are put beyond reach of those having this defect. For instance, they are absolutely unfit to engage in railway operation or manoeuvring of vessels. So are they, altough to somewhat less degree, for service in the Army and Navy and as physicians, chemists, artists, dyers, textile manufacturers, printers, etc.

The undermentioned is the returns obtained as a result of an examination held over the Primary School children, both Chinese and Japanese, above the fifth year grades :—

	Number of children examined		Actual number of cases of colour blindness	Percentage
Japanese children...	male	1,620	53	3.25%
	female	1,449	9	0.62%
Chinese children	male	557	11	1.97%

Remarks: No examination was held over the Chinese girls.

From the above, it will be seen that the cases of colour blindness among the Japanese children in South Manchuria are somewhat fewer with the males and slightly larger in number than the statistical data so far available, but, on the whole, the figures indicate but a trifling variation.

Then, the figure for the Chinese children is considerably smaller than that for the Japanese children.

VIII. Decayed Teeth of Japanese and Chinese School Children in South Manchuria.

Decayed teeth have a serious relation to good health. Moreover they have a considerable effect on the development of the children. This has naturally brought to the fore of late the question of oral hygiene of children.

The following table gives the results of examination over the Japanese and Chinese school children in Manchuria :—

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	Number of children examined	Those afflicted with decayed teeth	Percentage
Japanese children in Manchuria...	8,255	5,623	68.12%
„ in Japan	—	—	44.00%
Chinese children in Manchuria...	1,045	185	17.70%
As examined by Dr. K. Tanaka (Dental Superintendent Dairen Hospital, in 1916) ...	4,311	3,379	78.40%

From the above it is seen that the Japanese cases in Manchuria are 50% more than those in Japan, and a little less than four times as many as the Chinese cases. The results gained by Dr. Tanaka in 1916 give a somewhat higher rate, but are not widely apart.

What places the Chinese percentage so low and the Japanese rate in Manchuria so far above that in Japan form problems of much interest to be studied in future.

Some people are inclined to say that the cases of decayed teeth are proportionate to the civilization of the country, and this explains the higher percentage of the Japanese cases. However, there are others who say that the cases of this malady keep in proportion to the consumption of sugar.

The former theory may be handy in explaining away the difference between the Japanese and Chinese percentages, but will be found hardly logical to apply to the difference between the Japanese cases in Manchuria and in Japan. The latter theory will be found the handier. It may be said that sugar consumption in Manchuria is heavier than in Japan, and that the consumption rate for the Japanese is larger than that for the Chinese. But, it may be taken for granted that there are other causes to be looked for.

Conclusion.

To give the salient points of the results of the investigations above mentioned, all these points are worth enquiring into, so as to help studying the racial hygiene, and also to remedy the defects in the Japanese constitution.

The salient features are as under:—

(1) The physical development of Japanese School Children in Manchuria, and its comparison with the Japanese children in Japan.

(a) Stature. Comparing the stature of Japanese boy and girl children in Manchuria, from 7 up to 12 years of age, the boys are ahead of the girls, whilst between 13 and 14 years, the girls are in the lead.

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That the girls in Japan get in advance of the boys between 12 and 13 years means that the growth of the girls in Manchuria preceding puberty comes one year later.

(b) Stature of boys. As to boys, those in Manchuria beat their brothers in Japan between 7 and 11 years of age, but once above 12 years, the order is reversed at a wide margin.

(c) Stature of girls. Concerning girls, those in Manchuria are invariably superior to their sisters in Japan, only the former are inferior to the latter at the age of 13, denoting the earlier growth of the girls in Japan prior to puberty.

(d) Weight. In weight, the boy children in Manchuria beat their sister children between 7 and 12 years of age, whilst the order is reversed between 13 and 14 years. These circumstances also apply to the boy and girl children in Japan.

When each sex is compared between Manchuria and Japan, the former beats the latter in both sexes, especially the superiority is most marked at 11 and 12 years.

(e) Bust. As in Japan, the boys beat the girls in Manchuria, although at 14 years, the girls do slightly better.

Compared with the children in Japan, both boys and girls are inferior, although in a very slight measure.

(2) The physical development of Chinese School Children and its comparison with the Japanese children in Manchuria.

(a) Comparing the sexes, from 7 to 13 years of age, the odds are generally in favour of boys, but, between 14 and 15 years, the order is reversed. Thus, the growth preceding puberty comes to the Japanese girls in Manchuria later by a year, whilst the Chinese girls are still another year backward in this respect, which points deserve special notice.

Further, when the Chinese school children are compared in stature with the Japanese school children, the Chinese boys are slightly superior to their Japanese brothers, whilst the Chinese girls are ahead of their Japanese sisters between 7 and 8 years, but are far behind the latter at the other ages.

(b) Weight. In weight, the boys have as much advantage over the girls and *vice versa*. Compared with the Japanese school children in Manchuria,

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the Chinese children are above the former in the case of those of 7 and 8 years of age; but with the others the tables are turned against the Chinese, and the difference becomes more pronounced as the grades rise higher.

(c) Bust. At all ages, the boys beat the girls. Compared with the Japanese children of both sexes, their relative positions are similar to those in weight.

(3) The monthly sick rate of the Japanese children in Manchuria is 5.52% per month on an average. The first three months of the year, from January to March, produce the fewest number of sick children. The number is observed to increase gradually from April, decreasing again in August and September, to increase in October steadily up to December, which month gives the largest toll of 11.33%.

School Children in Bathing Ground, Hoshigaura, in suburbs of Dairen.

The sick rates for other diseases also vary according to the months.

(4) The cases of trachoma have been on the decrease since 1918, and although the ratios between the fresh cases and the cured cases also vary, the total average of each school gives an encouraging sign. The data are much alike to those obtaining in Japan. But the Chinese children give a far higher toll.

(5) In short sightedness, the percentages of boy and girl children (Japanese) in Manchuria are 18.66% and 25.40%, which latter appears rather high, compared with the statistics in Japan.

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So far the Chinese children have contributed a very small percentage, but a more thorough study must be conducted before a reliable conclusion can be drawn.

(6) As to defective hearing, the results of examination widely vary among the different schools, still they are distinctly lower than the returns in Germany.

(7) Regarding colour blindness, the respective data for Japanese boys and girls are 3.13% and 0.61%.

(8) Of the Japanese children in Manchuria, 86.12% are afflicted with decayed teeth, as against 44.0% for the Japanese children at home and in striking contrast with 17.7% for the Chinese children in Manchuria.

MANUFACTURE OF ARTIFICIAL PETROLEUM FROM BEAN OIL.

By Mr. M. Sato.
of Central Laboratory, S.M.R. Co, Dairen.

Introduction.

The origin of petroleum is divided between the organic and inorganic origins. The more popular view accepted among the scientists inclines to the former. The most influential one is its tracing to the biological origin, as advocated by Drs. Engler and Hefer and others. According to this view, animals and plants rich in fatty substances, which throve in by gone ages, got decayed or fermented, thereby being freed from the albumen and cellulose, and retaining the fatty substance. This substance got mostly decomposed either through water or enzyme into fatty acid, alcohol, etc. From the fatty acid and ester, carbonic acid gas became liberated, and from the alcohol, etc., the water was separated and hydrocarbon of high molecule was generated, which was further subjected to a decomposing process, and produced a liquidized hydrocarbon, composing natural petroleum. The same specialists say that these chemical changes took place under the high pressure underground.

The above mentioned theory was founded on the fact that, in 1888, Dr. Engler, while engaged in an experiment, happened to subject a quantity of fish oil to pressure and a distilling process and obtained an oily substance resembling petroleum.

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Other specialists have appeared who have attempted to modify the Engler doctrine.

Recently, in A. Kunkler u. H. Sciwedhelm, Seifensieder Ztg. 35, 165 (1908); 37, 391 (1910), it was announced that the production of petroleum was not perhaps owing to the direct decomposition of fatty acid, but to the decomposition of calcium salt produced by combining with limestone existing under ground. This theory was deduced from the obtaining of something like machine oil by heating and dry-distilling the mixture of fatty oil with carbonate of lime at 270°-320° C.

Later on, according to Ame Pictet u. Potok, Helv. Chim. Acta. 2. 501 (1919); chem. Zentralbl. 456. Bd. 1 (1920), and also A. D. Grun u. Th. Wirth, Ber. 1301 Bd. 2 (1920), the production of hydrocarbon of the petroleum series by the dry-distillation of sodium salts was experienced in connection with the study of the origin of petroleum.

The theory that the production of petroleum was due to the decomposition of animal and vegetable fats is a most important feature in tracing the origin of petroleum, and may be accepted as already demonstrated by practical experiments of those scientists of acknowledged authority.

However, the investigations of the same specialists have focalized as regards its industrially applied uses.

Recently in Japan, Dr. K. Kokayashi (in the January number of the Industrial Chemical Review in 1921) observes that fish oil may be directly decomposed in the existence of acidic earth for the manufacture of artificial petroleum for sundry applied uses.

I shall turn my attention to the laboratory experiments made by Dr. Kunkler and Dr. Sciwedhelm, and to the manufacture of calcium salt of fatty acid by the use of Bean Oil, its dry-distillation, and the product gained thereby.

Laboratory Experiments.

(1) Manufacture of Calcium Salt of Fatty Acid from Bean Oil.

In order to manufacture on economic lines calcium salt of fatty acid from Bean Oil, as the first stage of the hydrosis of fat adopted by Mr. Crevitz, a quantity of milk of lime may be applied to Bean Oil, to be heated and stirred suitably, and

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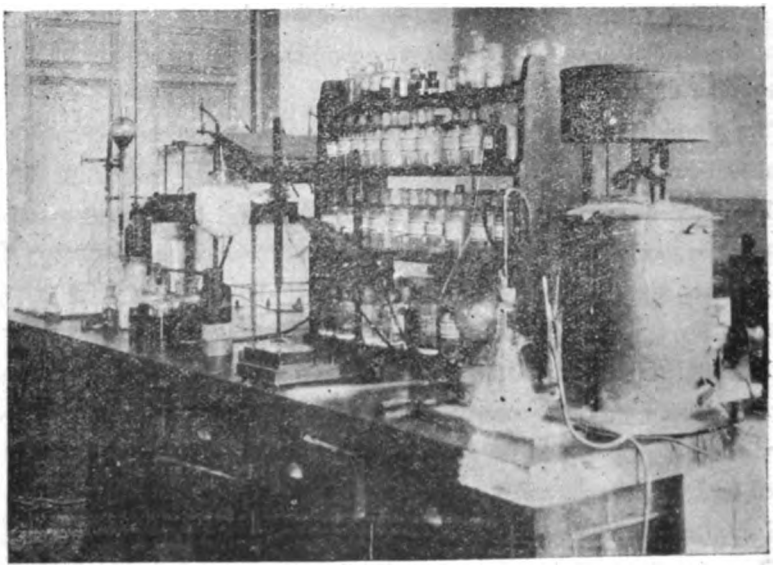
then calcium salt of fatty acid may be procured as a bye-product, together with glycerine.

By my experiments, the specimen of Bean Oil fatty acid purchased on the local market has given the following indices:—

Specific gravity: 0.9020 (27° C.)
Iodine value: 133.0
Saponified value: 218.1
Acid value: 212.4

The above shows how small the percentage of neutral fat contained.

The fatty acid may be heated on water bath and melted into a transparent liquid; then lime somewhat exceeding in quantity the prescribed amount may be



Dry Distillation Apparatus, Central Laboratory, Dairen.

dissolved in water, and this solution may be applied to the liquid above mentioned, while being stirred constantly. As the temperature rises, the reaction will soon be completed, producing a white mass of calcium salt of fatty acid. After cooling it, the liquid part thereof may be removed, and the free fatty substance may be separated by means of cold alchohol. Next, it may be washed in cold water several times so as to get rid of the free lime as much as possible. Then, diluted hydrochloric acid may be applied in a small quantity, to be washed in water and to be

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filtered and dried. The calcium salt of Bean Oil thus produced is a slightly yellow powder with the moisture of 5.5%, its composition consisting of the following:—

Bean Oil fatty acid	Calcium salt recovered	Percentage
500 grammes	533.5 grammes	100%
1500 „	1,564 „	97.8%

The recovered amount of calcium salt is close to the theoretical amount (the calculation being based upon the acceptance of Bean Oil fatty acid as oleic acid).

In short, it is necessary to use an excess amount of lime for the manufacture of calcium salt, and for material, Bean Oil may be used with almost equal returns, and in such case, glycerine may be recovered.

(II) Dry Distillation of Calcium Salt of Bean Oil Fatty Acid.

Theory of Dry Distillation. That fatty hydrocarbon is produced by the thermal decomposition of fatty acid alkali or alkaline earth is already established as above mentioned. But as to the mechanism of its reaction, node tailed explanation has yet been attempted. It is only recently that, together with the study of the origin of petroleum, an effort is being made to explain its mechanism by experiments.

Recently, Dr. Pictet conducted the distillation of stearic acid soda, and obtained lower saturated hydrocarbon by the fractionation of the distillate under ordinary pressure, in addition to tetratriacontan ($C_{34}H_{70}$). Then by dry-distillation of oleic acid soda in a like manner, unsaturated hydrocarbon was had.

As regards the production of tetratriacontan from stearic acid soda, an attempt was made to explain it upon the hypothetic acceptance of the existence of free alkali in the reaction. But, Mr. Grun, on the ground that such production could be easily accounted for, if a like supposition to the decomposition of formic acid could be made, gave the following reaction:—

$$2HCOONa = C_2O_4Na_2 + H_2$$
$$2C_{17}H_{35}CooNa = C_2O_4Na_2 + C_{17}H_{35}C_{17}H_{35}$$

Again, Mr. Grun, dry distilled stearic acid soda in vacuum separately and got penta tria contanon $C_{17}H_{35}COC_{17}H_{35}$.

At the dry-distillation of fatty acid alkali, ketone always forms and this is reduced by the hydrogen generated by cracking, and produces penta tria contagen, penta tria contanon, etc. In order to prove it, synthetic penta tria contanon is distilled in vacuum and is found to be distilled out almost without a change. It

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has been found that, by distillation under ordinary pressure, unsaturated hydrocarbon has been produced out of the whole thereof.

$$\begin{matrix} RCOO \\ RCOO \end{matrix}\!\!>\!Ca = \begin{matrix} R \\ R \end{matrix}\!\!>\!CO + CaCO_3$$

When fatty acid is dry-distilled in the existence of alkali or alkaline earth, ketone is known to form. Mr. Piria (in A. 32,249) and Mr. Haskelyne (in J. 1855, 519) both obtained palmiton ($C_{31}H_{62}O$) from palmitic acid, whilst Mr. Heintz (in 1885, J. 515, 576) found by experiment that from stearic acid, stearon or penta tria contanon ($C_{35}H_{7}O$) could be produced. However, it was Mr. Grun who explained by practical experiment ketone is produced as the intermediate product by dry-distillation of fatty acid salt. This theory may be regarded as explaining the most powerful reactionary mechanism in the dry distillation of fatty acid alkali. The production of hydrocarbon in the course of my own experiment is considered to be due to the same process.

Again, Mr. Grun once assumed that the decomposition observed in the experiments conducted by Mr. Pictet, etc., would occur similarly to the decomposition of formic acid soda, but, as he failed to discover the reaction of either oxalic acid or carbon monooxide gas, he concluded that such assumption was erroneous.

In my own experiment (dry-distillation under ordinary pressure), monoxide of carbon was observed in a comparatively large quantity among the dry distillation gases, making it rather difficult to deny absolutely the presence of such reaction, as stated by Mr. Grun. This point ought to be further looked into.

For the present purpose, I would like to infer that a decomposition similar to that of formic acid soda can also be produced during dry distillation.

In addition to the above two instances, the water produced by the decomposition while in process of dry distillation may cause a reaction as shown in the undermentioned formula to calcium salt of fatty acid:—

$$\begin{matrix} RCOO \\ RCOO \end{matrix}\!\!>\!Ca + H_2O = R' - R'' + CO_2 + CaCO_3$$

In short, as regards the reactionary mechanism to be produced in course of dry-distillation of calcium salt of fatty acid, further investigation is of course required owing to the complex nature of its products.

Again, the presence of a comparatively large quantity of unsaturated hydrocarbon, as noticed in my own experiment, confirms the Pictet theory that the dry-distilla-

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tion of oleic acid salt ordinarily generates unsaturated hydrocarbon, and endorses the view that the composition of the fatty acid of Bean Oil chiefly consists of oleic acid.

Dry Distillation Apparatus & State of Reaction. The dry distillation apparatus used by me in my experiments is very simple. A glass retort of a capacity for 500 to 1,000 cubic centimetres has pulverized asbestos put over the major part of the bulb. Then it is heated by gas flame, and then a pyrometer is put into the bottom of the retort to observe the dry distillation temperature, and the distilled vapor is so contrived as to get condensed after passing through the Liebig cooler. The non-condensed gas is led to the gas holder and has its volume measured.

The state of reaction in the retort varies more or less at each experiment. Under 200° C. no marked change is noticed, but with the rise of temperature, say, up to 250—270°, the contents gradually gain in yellow, and, expanding, generate gas, and once about 300°, the process of decomposition grows more active, the contents looking like viscus. The thin oily liquid of pale greenish yellow colour, which is distilled from one end of the cooler, also increases in quantity, the generation of non-condensable gas going on uninterrupted in the meanwhile. When farther heated up to about 500°, the contents will turn black and the distillate which once floated up will show a cracking phenomenon in process of decomposition on coming in touch with the wall of the retort highly heated. When heated for about three hours, the distillate will completely disappear, leaving at the bottom a residue of black colour resembling pitch.

Data obtained from experiments. The following gives the data of the products from dry distillation, as obtained from repeated experiments :—

	Bean oil calcium salt		Distilled oily liquid product		Specific gravity of oily liquid
1	100	grammes	70 3	cub. centimetre	0 8355
2	100	"	76.0	"	0.8314
3	100	"	70.0	"	0.8261
4	100	"	71.5	"	0.8137
5	100	"	76.2	"	0.8311
6	100	"	70 2	"	0.8151
7	150	"	average { 108.0	"	} 0.8230
8	150	"	{ 110.3	"	
9	150	"	average { 106.1	"	} 0.8236
10	150	"	{ 110.0	"	
Average	100	"	72.8	"	0.8246

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	gas generated	pitchlike residue
1	—	23.57 grammes
2	about 8 litres	24.30 »
3	8 »	25.30 »
4	8 »	—
5	7.5 »	26.01 »
6	7.0 »	—
7	10.0 »	—
8	— »	73.50
9	1.00 »	
10	1.10 »	—
Average	7.6 »	24.67

Remarks: (1) Dry distillation temperature (in the vessel) 480-520° C.
(2) Time of dry distillation 2 h. 40 m.-3 h. 20 m.
(3) After Experiment 7, dry distillation was conducted twice in succession in one retort. Therefore, the residue for the two distillations is given.
(4) At each dry distillation, with the oily distillate, a watery solution of some 70% to the raw material used was distilled out.

As is plain from the present table, distillation crude oil, distilled out in process of dry distillation (by which name the oily liquid distilled out is known provisionally) amounts to 73.8 cub. centimetres on an average (about 60 grammes in weight) to 100 grammes of Bean Oil calcium salf of fatty acid, never coming down below 70 cub. millimetres.

(3) Characteristics of Distillation Crude Oil.

Exterior. The mean specific gravity of distillation crude oil is 0.8246. It has a strong offensive odour resembling the preculiar smell given by cracked oil, perhaps due to the presence of unsaturated hydrocarbon. It is of light yellow greenish colour, and is clear, having fluorescence like ordinary kerosene. If left in the sun, it will gradually change colour into yellowish brown, turning finally to yellow brown colour.

Acid Value and Iodine Value. The results of observation of both acid value and iodine value from two specimens of distillation crude oil are as under:—

Specimen	Specific gravity	Acid value	Iodine value (Hubl method)
1	0.8261	0.3	117.4
2	0.8137	0.4	116.8

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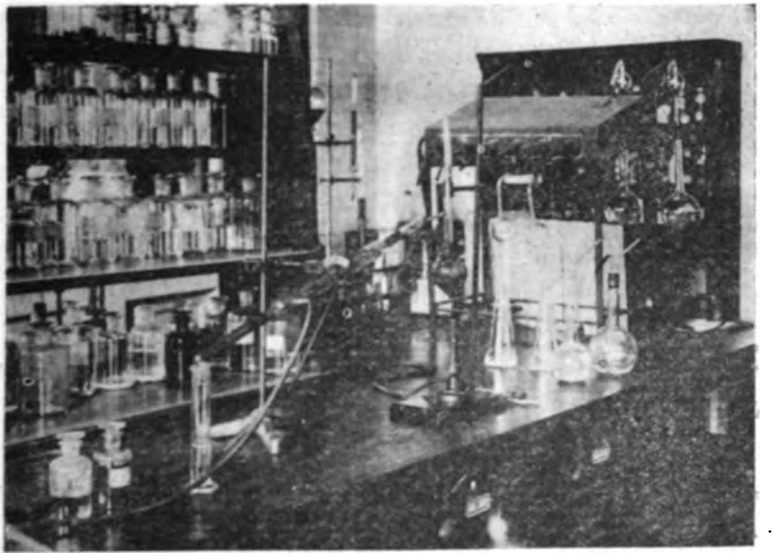
The free acid amount present in distillation crude oil is in an almost negligible quantity, indicating its remarkably higher iodine value than petroleum. From this, its possession of unsaturated hydrocarbon in a large quantity, thereby making it resemble cracked oil, may be inferred.



Fractional Distillation of Distillation Petroleum at Central Laboratory, Dairen.

Washing experiments in sulphuric acid and alkali. Like ordinary petroleum, two specimens of distillation crude oil were washed in sulphuric acid and alkali, and the extent of their loss resulting from the process was measured. The rate of absorbing iodine value before and after the washing was compared, the data thereof being as under:—

Specimen	Loss amt. from washing	Iodine value (Before washing)	Iodine value (After washing)
1	22.0%	117.4	88.9
2	23.5%	116.8	81.5

Remarks: For acid washing, thick sulphuric acid was used to the amount of 15%; and, for alkali washing, a solution of caustic soda (of 1.155 in specific gravity) to the extent of 5% was used.

The oil after the washing assumed somewhat reddish brown colour, and, when thick sulphuric acid was applied in drops, it took on a dark brownish colour.

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As the iodine value remained still high, it is clear that a larger amount of sulphuric acid is needed to make the washing process more thorough.

Observation of calorific value. In order to determine the value of distillation crude oil as fuel, it is necessary to observe its calorific value.

The calorific value of the two specimens abovementioned before washing was observed, and a comparison with a few specimens of ordinary petroleum and heavy petroleum was then made, the results being as follow:—

	Calorific value.
Distillation crude oil specimen 1	9956
" " 2	9974
Pennsylvania petroleum	9963
Baku petroleum	11640
Kashiwazaki (Japan) petroleum	11296
Nagaoka heavy petroleum	11204

As seen above, compared with ordinary kerosene, petroleum, and heavy petroleum, dry distillation petroleum has an almost equal calorific value.

Fractional distillation of distillation crude petroleum. 100 cubic centimetre of unwashed distillation crude oil was fractionated in a distillation flask under ordinary pressure; the results being as under:—

	Specimen 1	Specimen 2
Boiling point (C)	Amt. distilled out	Amt. distilled out
0– 80°	2.8 per cent	3.1 per cent.
80–100°	4.5 "	5.4 "
100–120°	5.0 "	5.5 "
125–150°	7.7 "	8.0 "
150–175°	6.6 "	5.9 "
175–200°	7.9 "	5.2 "
200–225°	8.8 "	8.0 "
225–250°	11.3 "	11.9 "
250–275°	12.8 "	10.7 "
275–300°	15.1 "	12.6 "
300–330°	9.4 "	11.9 "
Residue	6.0 "	7.2 "
Loss amt.	2.1 "	4.6 "
Total	100.0 "	100.0 "

Generally, the amount of oil distilled out tends to increase gradually with the rise of the boiling point, but no distinct data of such increase can be ascertained.

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The fractionated oil, as above mentioned, may be classified as follow, under the different names given by me for convenience sake :—

	Specimen 1 amt. distilled out	Specimen 2 amt. distilled out
Distillation light oil (under 150° C)	20% in volume	22%
„ middle oil (150°-300°)	62.5%	54.3%
„ heavy petroleum (300°-330°)	9.4%	11.0%
„ residue oil (left after distillation)	6.0%	7.2%

According to the above, distillation crude oil is found to contain much corresponding to middle oil or kerosene for lighting, followed with what corresponds to light or volatile oil. Heavy petroleum and residue oil correspond to kerosene and heavy petroleum.

(4) Characteristics of Fractionated Oil.

Characteristics of fractionated oils compared. Each fractionated oil had both its specific gravity and iodine value observed and went through a washing treatment each in sulphuric acid and alkali, as in the case of distillation crude petroleum. The data obtained are as follow :—

	Dry distilled			
Colour	Light oil Slightly yellow	Middle oil Pale yellow green	Heavy petroleum Deep yellow	Residue oil Dark brown
Specific gravity	0.7421	0.8360	0.8781	0.8490
Loss amt. from acid washing	20.0 in volume	20 1	7.0	—
Loss amt. from alkali washing ...	3.1 in volume	3.0	—	—
Iodine value (Hubl method)				
before washing ...	155.5	112.8	77.8	71.4
after washing ...	138.1	93.1	—	—

Remarks: (1) Both middle oil and heavy petroleum, if left in the sun, gradually change colour and grow deeper.

(2) The conditions for both acid and alkali washing were wholly identical with those for distillation crude petroleum.

In short, as the boiling point goes lower and the specific gravity decreases, the iodine value and the loss amount from acid washing increase. From this, the increase of the quantity of unsaturated hydrocarbon contained therein is deduced to increase also.

Fractional distillation of distillation light oil and middle oil.

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To start with, 50 cub. centimetres of distillation illuminating oil, unwashed, was subjected to fractional distillation with the following results:—

Boiling point (C)	Amt. distilled c.c.	Colour	Specific gravity (15° C.)
0 - 85°	10.5 (21%)	Colourless	0.7150
85°-100°	12.5 (25 0%)	„	
100°-125°	14.2 (28.4%)	Slightly yellow	0.7451
125°-150°	7.4 (14.8%)	Pale yellow	—
Residue	3.1 (6.2%)	Yellow	—
Loss	2.3 (4.6%)	—	—
Total	50.0 (100%)	—	—

Next, 100 c.c. of distillation middle oil was taken for fractional distillation, the results being as follow:—

Boiling point (C)	Amt. distilled out	Colour	Specific gravity (15° C.)
0-150°	0.2%	—	—
150°-175°	12.7%	Pale yellow green	0.7916
175°-200°	14.3%	„	0.8161
200°-225°	16.3%	Yellowish green	0.8300
225°-250°	17.6%	„	0.8379
250°-275°	19.3%	„	0.8440
275°-300°	15.0%	Yellow green	0.8573
Residue	3.1%	Yellow brown	—
Loss	1.5%		
Total	100%		

The relation of specific gravity to boiling point of distillation middle oil, compared with a few other kinds of illuminating petroleum and what is known as fish oil obtained from fish by Dr. Kobayashi, is as follows:—

Boiling point (C.)	American Chaster illuminating oil	Nishimura illuminating oil	Dr. Kobayashis fish oil	Distillation middle oil
150°-175°...	0.7527	0.7928	0.7852	0.7916
175°-200°...	0.7733	0.8138	0.7954	0.8161
200°-225°...	0.7927	0.8394	0.8098	0.8300
225°-250°...	0.8023	0.8492	0.8224	0 8379
250°-275°...	0.8117	0.8647	—	0.8440
275°-300°...	0.8258	0.8775	—	0.8573

Remarks: The above table has been prepared, taking into consideration the report by Dr. Kobayashi.

If seen from the mere points of boiling point and specific gravity of distillation middle oil, there are some kinds resembling Nishiyama illuminating oil and

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Dr. Kobayashi's illuminating fish oil, but a marked difference exists from illuminating oil of the Chaster Brand of America.

But, Nishiyama oil is held to contain as its principal ingredient hydrocarbon of paraffin series (hydrocarbon of olefine series being also contained), whilst Dr. Kobayashi's is accepted as containing hydrocarbon of naphtene series (illuminating fish oil containing a large quantity of hydrocarbon of olefine series).

If the above views are correct, distillation crude oil, if observed from its similarity in respect of both boiling point and specific gravity, may be placed under the head of hydrocarbon of naphtene which contains unsaturated hydrocarbon in a good quantity.

This point awaits further investigation.

Practical experiments with distillation middle oil. The principal part of distillation crude petroleum is middle oil, which, as already stated, corresponds to kerosene for lighting use. Unwashed oil was put through practical experiments, and, compared with the specifications of kerosene for lighting use of the South Manchuria Railway Company, the following data have been obtained:—

	S.M.R. Co. specifications	Distillation middle oil
Specific gravity	0.805 0.845	0.8300
Igniting point (Abel)	35°-60° (C.)	370
Sulphur	Under 0.02%	Trace
Acid ($S. O_3$)	Under 0.02	—
Sulphuric acid test	Pale yellow	Reddish brown
Fractional distillation test		
Up to 275° C.	85% or more	80.4%
275°-300° C.	Under 15.0%	15.0%
Illuminating test		
Average illuminating power.	7.0 candle power (5 hours)	6.9 candle power (2 hours)
Average consumption ...	Under 28 grammes (5 hours)	25 grammes (2 hours)
State of combustion	Above ordinary	Ordinary

From the above, unwashed distillation middle oil is found to be somewhat below the S. M. R. Co. specifications in the case of sulphuric acid test and fractional distillation test. (Note: Among the stocks on the market, there were few kinds which could stand the sulphuric acid test). In other points, the same oil passed the test, and on this account, it is considered as good for kerosene for lighting use.

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(5) Constituents of Dry Distillation Gas.

As above stated, gas is generated in a large quantity in process of dry distillation to the extent of some 8 litres to 100 grammes of calcium salt, its composition being as under:—

Carbonic acid gas	2.4%
Oxygen	4.0%
Dihydrocarbon	18.1%
Monooxide of carbon	10.3%
Hydrogen	1.4%
Methane...	50.7%
Nitrogen	12.3%
Total	99.2%

It will be thus observed that the chief compound of dry distillation gas is methane, and in this respect, it resembles natural gas produced in the petroleum fields. In addition, such more essential constituents as bicarburetted hydrogen, monooxide of carbon, etc., are found in a fair amount. Calculating the calorific power from these constituents, 23869 calories ought to be obtained (per 100 cubic ft.), and the actual amount available will not be less than 20,000 calories, which go to confirm the opinion that it makes an excellent fuel as well as lighting gas.

The nitrogen and oxygen contained in the above gas may be traced to the mixture of air inside the dry distillation apparatus. The reason why monooxide of carbon is contained in a comparatively large quantity is as already stated.

(6) Dry Distillation Residue and Water Distilled Out.

The residue left after the dry distillation is 24.7% on an average to the volume of the material. It is a black mass resembling pitch in appearance. Outwardly it seems to contain a good amount of volatile matter and fixed carbon. When it is pulverized and has diluted hydrochloric acid applied in drops, it will produce bubbles, showing the generation of carbonic acid gas.

Analyzed, is found to contain the following:—

Ignition loss	49.7%
Carbonic acid gas...	32.3%
Volatile matter and fixed carbon...	17.4%
Ignition residue left (lime)	50.3%

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From the above, it may be inferred that the lime contained in the residue exists chiefly in the form of bicarbonate.

The amount of the solution in the form of colourless liquid, distilled out while in course of dry distillation is about 7 c.c. per 100 grammes of raw material. It produces a remarkable acidic reaction, its acid value standing at 3.4. When the neutralized solution of caustic alkali is evaporated and dried on water bath, and to this sulphuric acid is applied, it will give a strong smell of acetic acid. This is perhaps because, by secondary reaction, a low fatty acid such as acetic acid has been produced.

Conclusion.

The above covers only part of the object of my investigations, and it will be premature for me at this stage to draw any conclusion therefrom.

However, these results of practical experiments may be summed up as below:—

(1) When calcium salt of Bean Oil fatty acid is dry distilled at about 500° C., distillation crude petroleum of 67 c.c. at the maximum, together with about 8 litres of dry distilled gas, will be obtained to 100 grammes of calcium salt. The calorific value of crude petroleum being 9965 calories on an average, it compares well with that of petroleum and heavy petroleum, and renders it available for sundry uses as liquid fuel.

Again, the dry distillation gas resembles natural gas in having methane for its principal compound. Besides, it contains such essential constituents as bihydrocarbon and monooxide in a comparatively large quantity, the amount generated being close to the gas amount produced in the low temperature dry distillation of coal, thus suggesting its availability as an article of fuel for domestic use and also as a source of light.

(2) When distillation petroleum is fractionated, light oil (under 150° C.) is obtained to the amount of about 20%; middle oil (150°-300°) to the amount of about 60%; heavy petroleum (300°-330° C.) to about 10%; and residue oil to the amount of about 6%.

Each compound has a high iodine value and contains also unsaturated hydrocarbon in a large amount, which latter's presence becoming more conspicuous as the boiling point comes down.

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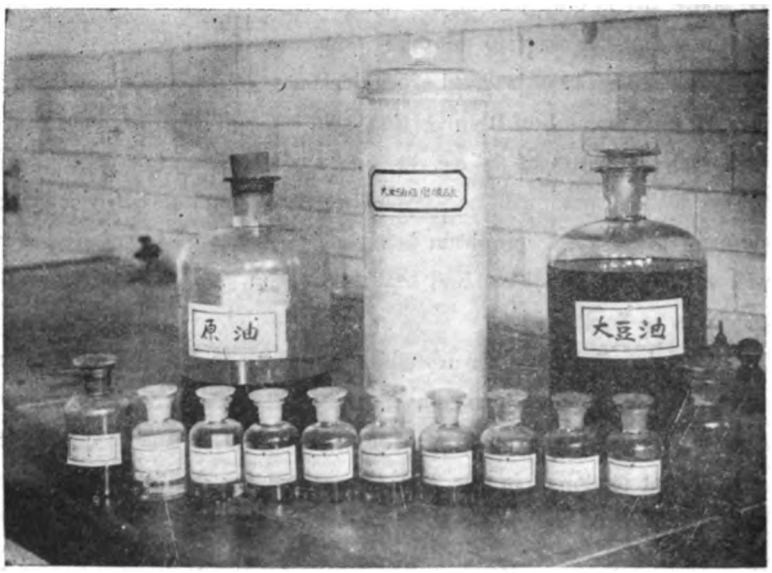
Taking the principal compound in the shape of middle oil, it has been used for the purpose of practical experiments, and has been shown to be quite as good as ordinary kerosene for lighting use.

As regards the other kinds of distilled oils, none has yet been subjected to practical experiments, but it may be presumed that each kind of oil may have its own use as fuel. Especially, the light oil compound is thought to be available as a substitute for volatile oil.

3) The characteristics of distillation crude petroleum bear a resemblance to kerosene put out in Japan and artificial kerosene manufactured from fish oil by Dr. Kobayashi, its chief compound appearing to belong to bydrocarbon of olefine and naphtene series.



Samples of Raw Materials and Products of Dry Distillation, Central Laboratory, Dairen.

It may be added that, my experiments having been carried on on a very small scale, allowances should be made for more or less discrepancy that may be observed, if the same process be adopted on an industrial scale.

However, if artificial oil should be made from Bean Oil (or any other vegetable oil or animal oil) on the basis of the present experiments, petroleum of

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about 7 *to* (27.776 gallons), together with 33 lbs. of glycerine and 480 cubic ft. of combustible gas, out of 1 *koku* (39.68 gallons) of Bean Oil may be obtained.

If Bean Oil put out in Manchuria be turned to the above mentioned use, the output amounts of these products will reach an enormous figure.

However, the use of so high priced a raw material as Bean Oil may, as things stand at present, lay many a difficulty in the way of fostering such an industry on a commercially workable footing.

However, the question of raising the efficiency of this industry in parallel with the manufacture of glycerine according to Mr. Crevitz's hydrosis of fat, it seems to me, deserves the attention of the wide awake specialists as a handy means of solving the fuel policy in time of need and also of meeting the revolution of the fuel problem that is bound to be brought up in future.

Moreover, if careful study should be made of every detail in the technical process to the end of securing a fuel oil of superior quality, the same process may, even at present, be incorporated on an industrial level with a promise as a paying venture.

I am prosecuting my investigations on this score, and may have the pleasure of publishing the further results.

MANCHURIA ENLIGHTENING SOCIETY.

Whose Organ the "Light of Manchuria" is

What actuates us in our endeavours to open up Manchuria and Mongolia lies in realizing our ultimate ideal in the enlightenment and development of Manchuria and Mongolia. It will not do only to develop the natural and industrial resources, but the ethical and intellectual culture of the inhabitants must also be carefully husbanded and nourished, so that both mind and matter may be developed in harmony.

The Manchuria Enlightening Society raised its first cry in order to fill a sorely felt need. Its primary mission is to investigate and propagate the truths of the development of Manchuria and Mongolia. We shall studiously refrain from misleading the public by disseminating inaccurate or exaggerated reports, but shall steadfastly adhere to the truth or facts only.

It is urgently important that the truths regarding Manchuria and Mongolia should be made known clearly not only to Japan and China, but also to Europe and America. On this account, the establishment of the Manchuria Enlightening Society is bound to have a serious significance of international character.

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If happily, through the establishment and activity of this Society, the truths of the development of Manchuria and Mongolia should become topics of world wide interest, it would not be only an honour to those now actively engaged in developing these regions, but also a matter of congratulation to the world at argle.

We might be permitted to add that the ultimate ideal and desire of this Society are to serve as the herald of all enlightening movements in future, thereby opening a new chapter in the annals of the world's civilization.

What is the Society Like.

a) Office.—The office of the Society is in the Municipal Office Building on Central Circle in the city of Dairen.

b) Society's Work.—The works of the Society include the following :—

1. Publication of the organ of the Society, The "Light of Manchuria."

2. Supply of general information through the Socitey and by other means, giving the results of such investigations and researches as may be conducted in the interest of the development of natural, industrial, and other resources in Manchuria, Mongolia, and Eastern Siberia.

3. To act as guide to intending investors in general in all kinds of enterprises in Manchuria, etc., and also to undertake any special investigation or research on application by promoters of all kinds.

4. To offer facility to travellers on inspecting visits to Manchuria, Mongolia, Siberia, Chosen (Korea), China, etc., to the end of importing accurate information and rendering their observations as close to truth as possible.

5. To use all kinds of means in order to propagate the true conditions obtaining in Manchuria, etc., and further to carry on the propaganda work for these regions through the medium of lecture meetings, exhibitions, etc.

6 To compile, publish, sell, and distribute books, pamphlets, etc., bearing on Manchuria and Eastern Siberia.

7. To carry on other works necessary for disseminating information on Manchuria, etc., and also for fostering economic enterprises therein.

c) In carrying on the above work, the Society is divided into the following :—

Secretariate,
Research Department,
Publication Department,
Intelligence Department, and
Accounting Department.

d) Any one wishing to join the Society is requested to send in a written application, giving the name and address, accompanied with the membership fee for not less than three months paid in advance.

e) The membership fee, entitling the member to a copy of the monthly organ, costs 50 sen (½ yen) per month and ¥6 per annum.

Remittances.

All remittances to this Society may be made most conveniently and safely to Transfer Savings No. 2850, Dairen. No receipts for the same will be issued, but instead the Society's monthly organ will be sent.

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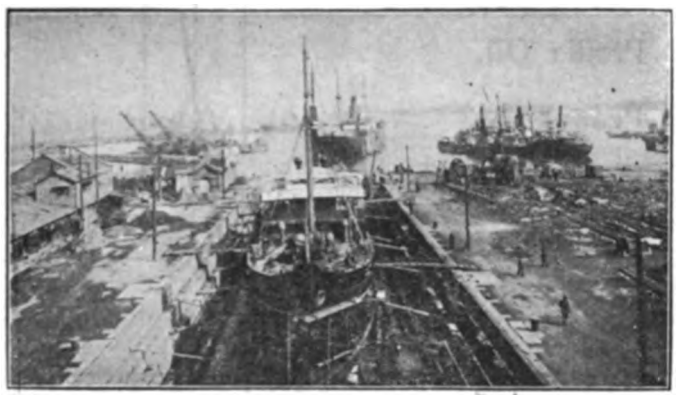

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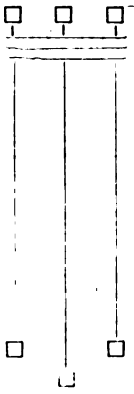

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THE

LIGHT OF MANCHURIA

THE PACIFIC OCEAN AND THE WORLD'S CIVILISATION.

PART II.

Continued from February Number.

By Mr. C. Kido,
Superintendent of the S.M.R. Co. Geological Institute.

We shall now trace the movement of the world's civilization by taking note of the differences between the Pacific and Atlantic Oceans, as mentioned in the preceding number.

Going back to the origin of mankind, the Pamir Plateau, which is often called the "Roof of the Earth," is marked as the place of the first habitation of man. From this Plateau, the human race began to emigrate westward and eastward. Those emigrating westward laid the foundation of the ancient civilization in Persia, Arabia, Asia Minor, and Egypt, propagating their brilliant civilization through Greece and Rome. The many ranges of mountains running from east to west, however, stood in the way, preventing the unification of the whole of Europe. Still, the number of the nations built up their own civilizations out of competition, and these had one and the same vein of the Western civilization running through them.

Thus, the very civilization, that moved westward from Pamir Plateau and flourished all over Europe, crossed the Atlantic to the American Continent through the medium of Great Britain.

The Atlantic is, as already stated, less wide than the Pacific. Both Europe and America slope gently to the Atlantic coasts, which are full of good harbours. And the civilization that kept moving westward readily embarked on the Atlantic and traversed it over to the other shores, where it was, so to speak, received with open arms. The Atlantic, even in the ages, in which material civilization was

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still comparatively young, did not prove a serious obstacle in the west-bound civilization.

On the other hand, the people, who started eastward from Pamir Plateau, built the foundation of their civilization in India and China. The Indian civilization found its way into China and thence into Japan via Korea (now called Chosen), evolving out what is known as the Oriental civilization.

Japan's geographical relation to the Pacific somewhat resembles that of Great Britain to the Atlantic.

Whilst Great Britain easily transplanted the Western civilization in America beyond the Atlantic, Japan used little effort to carry its Oriental civilization further eastward. Truly, the Pacific is much broader than the Atlantic. And few good harbours are found on the Pacific coasts. This has retarded the development of the marine or seafaring taste. On the west side, the Japanese made attempts to expand themselves on the eastern fringes of the Asiatic Continent. But, it was more than could be expected of the Japanese, not a seafaring people, to brave the unknown dangers of the mighty and limitless Pacific on the mission of carrying the Oriental civilization with them. Even supposing that such a task had been accomplished, the Rocky Mountains must have offered a great barrier for the eastward movement of the Oriental civilization.

The Oriental civilization has received its finishing touches at the hands of the Japanese people, and has, at the same time, ceased to grow.

The Western civilization, while spreading westward, started to move eastward also. It bathed the Pacific islands in the Tropics, and whilst the Japanese lived in seclusion, shutting all their doors fast against all outside communications, the Westerners had their flags waving among the banana and cocoanut groves on the Islands of Oceania.

How came the oriental civilization to be thus conservative and retrogressive, while the Occidental civilization has kept progressive and evolutionary?

It may be that the Occidental civilization has been reared in the cradles having the seacoast lines full of curves, which natural phenomenon fostered the taste for navigation early, whilst, as to the Oriental civilization, it originally germinated in the inland of India and China on Asiatic Continent, where the coast lines have few curves, and this had the contrary effect of retarding oversea

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communications. It was this very circumstance that has nurtured the conservative spirit. After the Oriental civilization was imported into Japan, her insular state, which has moulded the national character of her people, has further intensified the peculiar nature of the imported civilization. In short, the Occidental civilization may be regarded as "reared on the sea" and the Oriental civilization as "reared on land." This characteristic difference is also traced to the geographical variance between the Atlantic and Pacific Oceans.

The European civilization, which has been transplanted on the American Continent, has found a readily absorbing field on the American coasts gently sloping towards the Pacific, and has been quickly disseminated. The divers types of civilization fashioned by the different countries of Europe have become blended into a new civilization harmonizing with the American people. Even this tide of the Occidental civilization, with all its rapid mobility to carry itself forward, met a check in the Rocky Mountains. But this was only for a time. As a rich alluvial deposits were discovered in California in 1850, the natural barrier of the Rockies could not prevent a tide of prospectors and other seekers of fortune from moving from the east. In a short span of time, the Pacific coasts were converted into a flourishing region full of cities and towns. As the trans-continental railways were completed in 1866, the west bound current of the Occidental civilization veritably flooded the Pacific coasts. It was in the midst of this that the dense forests in Oregon and Washington came to be tapped, and the fertile plains of California were transformed into wheat fields and orchards. In 1867, Alaska was purchased of Russia, and this made the United States adjacent to the Asiatic Continent across the narrow strip of the Behring Strait. By 1896, the famous Klondike Gold Sand was discovered, and what was looked upon as a barren, desolate territory near the Arctic turned to one of nature's bounteous treasuries. The Pacific coasts of the United States have thus suddenly acquired a new importance, and under the traditional ideal of carrying the civilization westward, the new civilization cradled in the new Continent was launched on the Pacific Ocean. However, the Ocean is much wider than the Atlantic, and on its eastern fringe across the Ocean, the Japanese Islands, obstinate in adherence to their traditional policy of seclusion and entrenched in their own Oriental civilization, refused firmly to open their doors to the intruders.

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Prior to this, whilst the Occidental civilization slowly moved westward, it threaded its way eastward along the coasts over greater distances than the crossing of the Pacific. In 1550 (in the days of Ashikaga Yoshiharu), Portuguese merchantmen visited the port of Hirato in Hizen Province in Kyushu for the first time. In 1564, Great Britain, too, approached Oda Nobunaga (then the strongest general in Japan and the greatest favourite to the Imperial Court) to open trade intercourse. Thus, the first sparks of the Occidental civilization gleamed on the western shore of Japan. But Japan was in no mood to take kindly to the new Occidental civilization. In the latter periods of the Tokugawa Shogunate (Regency), that is, some 300 later than the first time the Occidentals ever knocked at Japan's door, Commodore Perry of the United States effected his landing on Japanese soil on the mission of opening international intercourse with Japan. This was in 1853. Thus the Occidental civilization which moved eastward and westward met each other in Japan, on the primary coast lines of the Pacific, demonstrating the spherical character of the earth itself. It had the effect of awakening the Oriental civilization, and this culminated in bringing about the great Restoration, by which the supreme power of rule was restored perfectly to the Imperial Court by the Tokugawa Shogunate.

Since the Restoration, Japan's advance has been marvellous. After the Sino-Japanese and the Russo-Japanese Wars, and after taking an active part in the World's War, Japan has pressed ahead to take her rank among the "Big Five." She has also taken up the mandate rule of the German colonies in the South Seas north of the Equator.

Japan's history during these fifty odd years has added pages of brilliant achievements in every respect, in which any nation on earth may take a just pride. It has evoked the wonder and even admiration of the rest of the world.

The Oriental civilization has been perfected by the Japanese after being distilled through India, China, and Chosen (Korea), whilst the Occidental civilization has matured in the United States after blending the civilization peculiar to Great Britain, France, Germany, etc.

Whilst the Oriental civilization remained stationary on the western coasts of the Pacific, the Occidental civilization proceeded westward and eastward to get fused with the other. Now both have met, and what will be the outcome of their

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meeting? Is it to be a clash or a fusion? It must be either. A happy blending of the two will place mankind on the new road to happiness and evolution. The absorption of one into other might prove the preponderance of the absorber, which can hardly tend to be an undivided blessing to mankind.

It is time that the Oriental and Occidental civilizations that have met on the eastern shores of the Asiatic Continent should give birth to a new healthy civilization on their being happily blended. It ought to be above a material civilization; it must be a vigorous and potential kind that perfectly coincides with the Laws of Nature, free from any degenerating or enervating influence, but rejuvenating like the vernal energy and productive like the bumper autumn harvests, and above all beautiful and lasting like an Eden of perennial flowers.

(Concluded)

BEAN OIL AND ITS PRODUCTS.

By Mr. M. Akita, late of the S.M.R. Co. Central Laboratory, Dairen.

Continued from the December (1921) Number.

VI. Bean Oil and Comparison with a few other Kinds of Fat.

We have already classified Bean Oil as a semi-drying vegetable oil. It may be added that its drying property is much stronger than that of any other of its class, indeed so much as to put it very close to a drying oil. In iodine value, Bean Oil ranks between a drying oil and a semi-drying oil, but it differs from a drying oil in that it contains a smaller quantity of linolenic acid and has as the chief fatty acids linolic acid and oleic acid.

For a comparative study the characteristics of Bean Oil, together with those of the other principal semi-drying vegetable oils such as cotton seed oil, sesamum oil, rapeseed oil, and also linseed oil and paulownia oil which are drying vegetable oils in extensive use, etc. are given under:—

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	Bean oil	Cottonesed oil	Rapeseed oil
Specific gravity	15° 0.9256 (Tsujimoto)	15° 0.922–0.930 (Allen)	15° 0.9169–0.9183 (Tsujimoto)
Freezing point...	15°–16° (Keimatsu)	—	10° (Lewkowitsch)
Saponification value	192.62 (Tsujimoto)	191–196.5 (Allen)	174.17–176.48 (Tsujimoto)
Iodine value	132.50 (Tsujimoto)	106–196.5 (Wijs)	99.76–103.33 (Tsujimoto)
Hehner value	95.7 (Tsujimoto)	95.9 (Lewkowitsch)	94.56–96.3 (Kresley Ruswehr)
Reichert Meissl value	0.55 (Nishiyama)	—	0.0–0.97 (Lewkowitsch)
Maumene value	96 (Nishiyama)	74–75 (Allen) 50–53 (De Negri Fabris)	—
Refractive value	20° 1.4755 (Tsujimoto)	60° 1.4570 (Terner)	20° 1.4725–1.4727 (Tsujimoto)
Butter refractometer	20° 75.2 (Tsujimoto)	25° 67.6–69.4 (Benedict Wolfbauer)	20° 70.3–70.6 (Tsujimoto)
Viscosity (Redwood)	20° 280″ (Tsujimoto)	—	—

	Sesamum oil	Linseed oil	Paulownia oil
Specific gravity	15° 0.9230–0.9237 (De Negri Fabris)	15.5° 0.930–0.933 (Tsujimoto)	15.5° 0.9331 (Higuchi)
Freezing point...	4–6° (De Negri Fabris)	27°	under 30° (Higuchi)
Saponification value	188.5–190.4 (De Negri Fabris)	191.15–191.94 (Tsujimoto)	198.33 (Higuchi)
Iodine value	107–108 (De Negri Fabris)	179.15–185.72 (Tsujimoto)	169.02 (Higuchi)
Hehner value	95.01–95.86 (Springmeyer Wagner)	95.5 (Lewkowitsch)	95.55 (Higuchi)
Reichert Meisal value	0.17–0.40 (Springmeyer Wagner)	0.00 (Kresley Ruswehr)	—
Maumene value	63–64 (De Negri Fabris)	104–111 (Allen)	—
Refractive value	20°–1.4730 (Wutz)	10° 1.4818–1.4829 (Tsujimoto)	19° 1.503 (Jenkins)
Butter refractometer	20°–71.1 (Wutz)	20° 86.1–88.0 (Tsujimoto)	—
Viscosity (Redwood)	21° 370–380″ (Lewkowitsch)	—	—

Remarks:—The names mentioned in brackets denote those of the observers.

VII. Method of Detection.

As Bean Oil is cheaper in price than any seed oil on the market, it is seldom adulterated with other kinds of fat.

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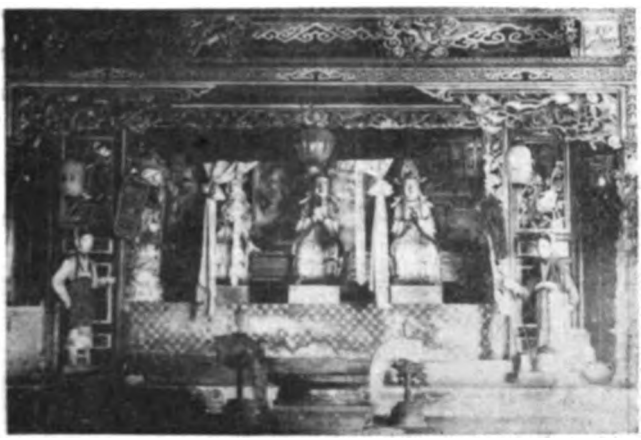
For reference sake, the detecting methods for a few kinds of fat are given under :—

Cotton Seed Oil. It is easily detected by the Halphen Reaction method. By this test, 2 c.c. each of cotton seed oil, amyl alcohol, and carbon bisulphide solution containing 1% of precipitated sulphur, is put in a test tube, and half the tube is put in boiled common salt solution, to be heated for ten minutes. When the contents show red or orange colour, it proves the presence of cotton seed oil. In case of their failing to show any such colour, evaporated carbon bisulphide may be added, and they may be further heated for five or ten minutes, to see if they will assume either colour.



Kwanmon Temple on the side of Mt. Phoenix on Mukden-Antung Line.

The above test having a drawback as mentioned under, it is only rarely resorted to :—

a) When heated above 250°, or when the cotton seed oil is treated with chlorine or sulphurous acid, no colour reaction will take place.

b) Fat obtained from cattle or pigs fed on cotton seed oil will give the colour reaction in a pronounced manner.

Linseed oil. As this kind of oil is characterized with the increase of iodine value and non-soluble bromination value, its presence is easily detected.

The observation by the iodine value is effective when Bean Oil is mixed above 30%. In case of the percentage of Bean Oil being lower, the adoption of the hexabromination test is recommended.

Mineral Oil. The observation of the non saponifiable substance will enable one to ascertain easily either its presence or absence.

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Detection of Bean Oil. When Bean Oil is mixed with some other kind of fat, its detection is a matter of comparative difficulty.

Recently, a few colour reactions indicative of the presence of Bean Oil have been invented, but their actual merit still remains indefinite.

a) Settimi's Reaction. 5 c.c. of Bean Oil is treated with 2 c c. of chloroform and 2% of uranium nitrate, and 3 c.c. of water solution. When this mixture is shaken well, an emulsion of lemon orange is produced. Olenic acid may often cause an emulsion of pale yellow to appear, but all other kinds of fat produce a white emulsion. (L. Settimi: Ann. Lab. Gebelle: 1912. 6 461-465).

b) 10 c.c. of Bean Oil is added to 2% of nitric acid and 3 c.c. of ether solution of uranium, and the mixture is steeped for two minutes in saline water of 102°, then, the Bean Oil will assume deep yellow colour, changing later to olive green.

Chinese Lotus Park in Chinese City of Mukden.

By the same method, sesamum oil, maize oil, etc., will show orange colour, whilst cotton seed oil will give a white precipitaion in a large quantity. Olive oil only shows very light green. When boiled for twenty minutes, Bean Oil presents deep red like that of the pomegranate; other fats will give a clear red, and olive oil and kindred oils will turn yellow. (L. Settimi: Chem. Abst. 1913. 908).

c) Newhall's Reaction. 5 c.c. of oil to be tested may be mixed with 5 c.c. of chloroform. A few drops of india rubber solution may then be applied. Then, 2% of nitric acid uranium or 5 c.c. of acetic acid uranium solution may be added, and the mixture may be shaken well into a perfect emulsion. At this juncture, the Bean Oil will show its characteristic orange colour.

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Bean Oil, when bleached or deodorized, hardened oil, fatty acid, etc., will not show the orange colour. (Charles A. Newhall. 1. Ind. Eng. Chem. 12. 1174. 1920).

(d) Electrical Test. In G. Dalliacqua: Groin chim. applicatal. 48-53, 1920, Mr. Dalliacqua has recently published how to detect Bean Oil by an observation by means of the electrical insulation method in substance as follows:—

A vessel made of silver or platinum which connects electrically with earth by means of an electrospcope and silver wire is filled with Bean Oil, one end of the silver wire being required to be at a certain distance from the centre of the bottom of the vessel. Next, the electroscope is charged with electricity by means of an electrified ebonite bar, and, after the gold leaf on the electroscope has been opened, the time required for taking off the leaf over a certain part is observed. In the case of ordinary fat, from 15 to 100 seconds or more are required.

Little variation has been noticed in the observations conducted with other kinds of fat and testing materials released from the free fatty acid.

Hower, according to Mr. Dalliacqua's results of observation concerning Bean Oil by means of the Elster's and Guiter's electroscope, the time required was only 1.6 seconds in striking contrast with other fats, thereby confirming the efficacy of the test in the detection of Bean Oil.

The same specialist has experimented upon the same testing method, using other kinds of electroscope, in order to determine the real merit of this method, and has had the satisfaction of obtaining practically the same results.

Mixture of Bean Oil and Olive Oil.

Bean Oil	Olive Oil	Time required for taking off the gold leaf.
0	100	16 seconds.
10	90	4 ,,
20	80	2 ,,
30	70	1 ,,
40	60	less than 1 second.
100	0	Too quick to measure the length of time required.

From the above, this method is pronounced as effective in detecting Bean Oil,

(e) Hexa Bromination Method. This method is used in detecting Bean Oil adulterated with linseed oil. The hexa bromination value of linseed oil ranges between 45.6 and 46.9, whilst that of Bean Oil is 2.2 on an average, the maximum

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not going above 5. By this method, Bean Oil is said to be detectable up to 5% according to the Bureau of Standard, J. Soc. Chem. Ind. 1919. 38, 437 R.

VIII. Oil Obtained from Bean Cake.

Mr. S. Uyeno (in p. 56 No. 9 of the Report of the Industrial Experimental Institute) has stated as follows, concerning the oil obtained from Bean Cake, the residue left after Bean Oil has been expressed from Beans:—

Bean cake is used as fertilizer, but contains ordinarily 7-9% of oil.

Entrance Gate to North Mausoleum, Mukden.

At the Lever Bros. Soap Factory at Amagasaki, Bean Cake is crushed into powder, and the oil contained therein is extracted by means of benzine, using the oil so extracted as soap-making material.

There are also many Japanese planning to extract the oil from Bean Cake. This Bean Cake, once the oil contained therein has been extracted, can be pulverized more easily, giving it a greater fertilizing property.

Some soap manufacturers are under the wrong impression that the oil left in Bean Cake contains a comparatively large quantity of fixed fatty acid and on this account the oil is not so good as ordinary Bean Oil as soap-making material.

For this reason, oil has been extracted from Bean Cake, and subjected to the following experiment:—

The specimen of Bean cake used for the experiment was put out at Newchwang. It was found pulverized when bought. It was 42° in temperature, but rose to 44.5° in an hour. When left for five or six months, it once reached the maximum temperature of 50°. This rise in temperature was perhaps due to the oxidisation and subsequent decomposition of the oil.

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This same specimen contained 15.1% of water and 7.13% of oil (extracted by ether). The oil obtained from two kilogrammes of Bean Cake by means of ether is of dark brown and has a smell like soy. It gets dissolved in alcohol of 96% and the solution is clear. Again the oil causes much solid fixed matter (of crystalline form) to appear. This solid matter may be free fatty acid.

The acid value and other properties of the oil are as under :—

Specific gravity (15.5° water 4°)	0.9174
Acid value	155.37
Oxidation value	197.89
Iodine value	132.20
Refractive value (20°)...	1.4723
Butter Refractometer (20°)...	70.0

The observation of the oxi-acid according to the Farrion method has shown it to be 2.68%. Again, oil has been extracted from Bean Cake by means of ether, and been treated with petroleum ether, to eliminate the oxi-acid and glyceride. Then, the petroleum ether has been distilled, the properties of the oil being as under :—

Specific gravity (15° water 4°)...	0.9118
Acid value	157.83
Saponification value	189.50
Iodine value (Wijs method)	132.68
Refractive value (20°)...	1.4672
Butter Refractometer (20°)	62.0

What makes the refractive value of the oil extracted by means of ether higher than that of the oil dissolved in petroleum ether is perhaps owing to the presence of oxi-acid and glyceride. Next, why the oil dissolved in petroleum ether has a lower iodine value than the refractive value may be due to the presence of free fatty acid in a large quantity.

Ordinary Bean Oil is of 132-135 in iodine value. On this account, the oil extracted from Bean Cake is materially the same as ordinary Bean Oil.

Calcium soap made from the extracted oil is of deep brown and gets coloured gradually.

From the above experiment, the oil extracted out of Bean Cake is found to contain much free fatty acid and a small quantity of oxi-acid (and also glyceride). Its iodine value being almost equal to that of ordinary Bean Oil, the

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oil itself is of an indifferent quality, and like ordinary Bean Oil, it is considered as not a fine material for making white hard soap.

No other essay or such like on Bean Cake Oil than the report by Mr. Uyeno is known to exist.

IX. Denaturation of Bean Oil.

The Australian Government published by No. 195 of Supplementary Notice of Taxation Law No. 234 dated April 23, 1912, the method of denaturing Bean Oil for industrial use at the time of import, as a means of securing a reduction in the import tariff or a total exemption therefrom :—

According to the above notice, Bean Oil for industrial use may have the import tariff wholly exempted or reduced, in case of its being denatured as undermentioned :—

(1) Addition of 25 gallons of Neats foot oil and 25 gallons of petroleum of 300° test to 500 gallons of Bean Oil.

(2) Addition of 5 gallons of turpentine and the same amount of terebene to 900 gallons of Bean Oil.

(3) Addition of 25 gallons of paulownia oil to 100 gallons of Bean Oil.

Any of the above mentioned three methods is made optional.

Subsequently, the fourth method of denaturation was added to the following effect :—

(4) Addition of 15 gallons of boiled linseed oil to 800 gallons of Bean Oil.

It is reported that the announcement of the above notices roused loud comments of varied natures among the industrial community of Australia.

X. Uses of Bean Oil.

Substitute for India Rubber.

Messrs. F. Grosul and A. Sauer planned to manufacture a substitute for India rubber by subjecting Bean Oil to varied chemical processes. They secured a patent right for the method they invented in 1909, which was substantially as follows :—

To 100% of Bean Oil 30-50% of nitric acid is added. The mixture will present a milk-like appearance. It is then heated to 75°-100°. In a little over

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10 minutes a reaction will take place, raising the temperature to 130°. This reaction is not to nitrify but to oxidize. On the completion of the reaction, the oil will assume a foglike appearance. It is then cooled and washed, and is

Fengtien Governor's Yamen in Chinese City of Mukden.

treated with 200% of 5% ammonia solution, so as to get the mixture dissolved. It is recommended to execute this process at the temperature of 75°-150° so as to bring out the effect of the ammonia solution to full play. When pressure is applied, so much the better.

To this ammonia solution, a thin acid is applied, so as to make it either altogether neutral or only slightly acid. The precipitate should have the moisture removed by pressure, and be heated up to 150°, so that it may be mechanically treated by an ordinary method. (German patent No. 28887, June 10, 1907).

Thus an elastic matter resembling India rubber is obtained. This substance also admits of being vulcanized by means of sulphur. When necessary, a suitable quantity of sulphur may be added to advantage before being heated.

Messrs. Grosul and Sauer prosecuted their studies further and devised several other methods, securing the French patent right for one of them in 1911.

This method may be summarized under:—

1) How to oxidate Bean Oil above mentioned by means of nitric acid (German patent No. 228887).

2) How to mix 7-12% of sulphur with 40% of Bean Oil and to heat the mixture to 150°-190°.

3) How to add 8°-14° of sulphur chloride to 40% of Bean Oil and to heat it.

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In carrying out this method, heat is applied to quicken the reaction at first, but, after the reaction has taken place, it should be cooled down to ordinary temperature, if necessary. Also it is advisable to make the Bean Oil thinner by use of benzine beforehand.

4) How to heat Bean Oil above the boiling point for a suitable length of time, and how to heat it together with sulphur after part thereof has become polymerized.

5) How to send in heated air after the usual additions have been annexed.

(*French patent No. 430183, April 1, 1911.*)

Substitutes for India rubber are said to be obtainable by the several methods above mentioned.

Mr. Y. Nishiyama (p. 766 No. 11, Journal of Industrial Chemistry 1908) has dissolved Bean Oil in carbont etrachloride, applying thereto further sulphur chloride. This mixture is then stirred, and a substitute for India rubber has been obtained, but the product is of indifferent quality.

Next, about 20% of sulphur is mixed with Bean Oil, and has been heated up to 130°, being left at that temperature for three hours. It has only grown thicker, but has failed to solidify.

The same specialist, in prosecution of his study, has used oxide of lead with boiled Bean Oil, but little result has been had.

Next, Bean Oil, into which air has been blown in for ten hours (0 9421 in specific gravity) has been used for a series of tests by means of sulphur in different quantities.

(1)	To Bean Oil, into which air has been blown,	10% of sulphur
(2)	„	15% „
(3)	„	20% „

The results of experiments have shown that, in the case of (1), sulphur has become thoroughly dissolved, and as it has cooled off, sulphur has been crystallized out, looking like fine down in appearance. In the case of both (2) and (3) the mixture has got perfectly solidified, but in point of elasticity, etc., it has been considered to be inferior to what has been made from other drying oil.

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From the above results of Mr. Nishiyama's experiments, it is plain that although a substitute for India rubber may be had, yet the product seems to fall short of the expectations.

Little in writing has been noted concerning the manufacture of India rubber substitutes from Bean Oil, but the author himself considers this question as promising a happy solution.

Soap.

Most of what Bean Oil is exported to Europe, inparticular to Great Britain and Germany, is now being imported again into the Orient in the form of soap. This phenomenon bespeaks in itself how backward the chemical industrial enterprises have been in Japan. A welcome tendency has made its appearance lately in Japan as well as in the Kwantung Leased Territory to manufacture soap from Bean Oil. In some cases, the venture has already been launched; in other cases it is under project.

Anglers' Hill on Mukden-Antung Line (near Chiaotou).

Bean oil soap takes its rank in quality between manufactures from maize oil and cotton seed oil.

It is rather difficult to saponify Bean Oil, and in case of the saponification process being imperfect, the product, like soap made out of cottonseed oil, will readily deteriorate, emitting a disagreeable odour and showing yellow spots.

Mr. G. Uyehata (p. 479, No. 13, Journal of Industrial Chemistry, 1910) has conducted painstaking study concerning Bean Oil soap. The following is the gist of his report thereanent:—

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As above mentioned, the saponification of Bean Oil is found some what difficult. When alkaline solution of 25°-35° Be. is made use of, as by the ordinary method, the disintegration of the constituents of soap will take place, causing an imperfect saponification.

According to practical experiments, the most suitable solution is one of 15° Be. or diluted even more thinly.

When such as tallow, cocoanut oil, resin, etc., which are readily saponifiable in Bean Oil are mixed with Bean Oil, the saponifying process is greatly facilitated through their accelerating influence.

Bean Oil should not be used singly for soap making material, but ought to be employed together with other materials abovementioned. Therefore, its saponification is not necessarily difficult, provided the right density of the solution is procured.

Hitherto Bean Oil has been decried for giving an offensive odour as time goes by, but this, as already observed, is owing to the imperfect saponification, the bad smell being caused by the decomposition of the free fatty acid.

A few kinds of experimentally made soap, some having a bad odour, and others free therefrom, have been analyzed as under:—

	Materials	Odour	Freefatty acid
Specimen 1	40% Bean Oil and 60% of tallow	Bad smell	4.22
2	50% Bean Oil and 50% of tallow	„	5.42
3	70% Bean Oil and 30% of tallow	Odourless	0.62

The above shows that, so long as the saponification process has been perfect, excellent results may be depended upon.

Even in the case of soap made by the mixture of a larger quantity of Bean Oil, if the saponifying operation has been perfect, the product will be found to be compact and not brittle. Besides, such as has undergone a good kneading will assume a pretty lustre.

Then water glass may be applied in a suitable quantity to harden the product further, and in order to impart a finer lustre, starch may be mixed.

Pure Bean oil soap may wear a dark yellowish colour, but this may be changed to yellow or cream colour by adding a suitable amount of tallow or cocoanut oil. But soap of this kind is apt to put on a dark tint on the lapse of a long time.

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The notable features in the manufacture of Bean Oil soap include that (1) it is readily liable to get coagulated by means of thick alkaline solution. Therefore, in saponifying it, thin salt solution of 5-1% must be used. By availing of this peculiarity, a solution of thick caustic sod amay be used instead; and that (2) as soap it gives foam more freely and is also softer to the touch. It is also good to use not only in fresh water, but also in sea water.

The frothing power of Bean Oil soap has been tested in salt solution of varying concentration. In a solution of 1-2%, no effect has been noticed on the generation of foam. With one of 3-4%, foam has formed indeed, but the soap has got rather rough to the feel. When the percentage goes above 5%, no foam is generated.

Such peculiar properties are not observed with any other kind of oil, excepting cocoanut oil.

Mr. Uyehata, in reviewing the results of his investigations, as above described, says that Bean Oil soap does not rank in quality behind cotton seed oil soap. On the contrary the former is richer in froth-generating power and has another advantage of being serviceable in seawater. Therefore, Bean Oil may be recommended as soap making material.

Mr. Uyehata has further laid stress on the promising nature of Bean Oil as soap making material as follows:—

(a) Toilette soap. When mixed with a suitable quantity of tallow, toilette soap of compact composition is obtained. It is besides lustrous, and has a high foaming property, and can stand hard water. Thus, in quality and efficacy it compares favourably with soap made from ordinary tallow.

Chinese Stilt Dance.

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(b) Laundry soap. As laundry soap, the price is cheap in the first place, and it also has a high cleansing power. As appearances are a secondary consideration, a kind of excellent quality may be obtained by the use of tallow, cocoaunt oil, etc.

(c) Potassium soap. Ordinarily it is made of linseed oil, but by the use of Bean Oil, a superior article in both quality and efficacy may be obtained. Unlike sodium soap, it gets easily saponified and moreover the manufacturing process is also quite simple.

(d) Transparent soap. Ordinarily, such vegetable oil as tallow, cocoaunt oil, or linseed oil is mixed for the purpose of saponification, whilst alcohol or sugar is applied to secure the transparency of the product.

By the use of Bean Oil, an article as superior is obtainable.

(e) Floating soap. Floating soap in recent use is made to contain much bubble at the time of saponification with its specific gravity as small, and its dimensions as large as possible.

As raw material, cocoanut oil or tallow is used, and this will give it too pale a colour and will place it far below Ivory Soap in both quality and efficacy.

If Bean Oil is used, its high property to create foam will make it easy to put much bubble therein during the process of manufacture.

In appearances, too, as time goes by, it will assume a dark tint, and will come to bear a close resemblance to "Ivory Soap," not at all inferior thereto in cleansing and foaming power.

(f) Silk scouring soap. Bean Oil contains only a little fixed fatty acid, and as soap made therefrom is possessed of high dissolving power, Bean Oil serves excellently as material for silk couring soap. Of course there can be no comparison with Marseilles soap, but as raw materials are cheap, it is thought to have a commercial possibility.

Mr. Uyehata has further reached a conclusion as a result of his investigation, to the following effect:—

The larger quantity of tallow is mixed with Bean Oil, the more easily will the saponifying process for Bean Oil be effected. Such as contains more than 20% of tallow will give a product having a suitable degree of hardness. Moreover,

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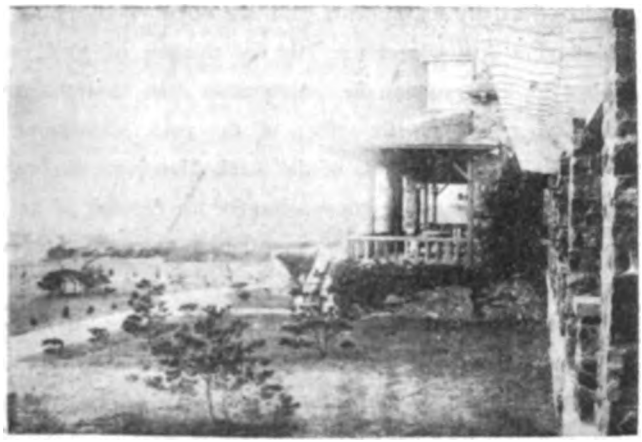
it has the peculiar property of Bean Oil soap to stand hard water. Again, by regulating the amount of tallow, the colour of the product may be turned to cream from dark yellow. Then the soap is compact and odourless, being superior to tallow soap on the market. Although the soap is rather apt to absorb moisture, such possibility may be minimized, if the manufacturing process be effected with thorough care. However, there is likelihood of the soap taking on more or less darker shade with the lapse of time.



Yamato Hotel, Hoshigaura, seaside resort in suburbs of Dairen.

Generally speaking, sodium soap obtainable from Bean Oil is yellow, whilst potassium soap is of dark gold yellow and transparent.

Mr. M. Tsujimoto (p. 156, No. 25, Journal of Industrial Chemistry, 1912), as a result of study, has concluded that manufacture of white soap from Bean Oil is impossible.

As regards soap made from the oil obtained from Bean Cake, reference is invited to Chapter VIII.

Lubricating Oil.

Bean Oil, partaking of drying property, cannot be employed directly for lubricating purposes.

Mr. Nishiyama (p. 764, No. 11, Journal of Industrial Chemistry, 1908) has observed that what is to be used as lubricating oil should have air blown thereinto. If Bean Oil has air blown thereinto while being heated, it will acquire greater viscosity and increase in weight. It will not be difficult to raise its specific gravity to 0.94-0.95. This oil is available, in Mr. Nishiyama's opinion, as lubricating oil, if mixed with heavy petroleum.

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Then Bean Oil may be used for lowering the freezing point of a machine oil.

Mr. K. Tanaka (p. 643, No. 22, Journal of Industrial Chemistry, 1919) has conducted sundry experiments with the object of obtaining a mixed oil, that will withstand a low temperature, by the mixture of some vegetable oil which is subject to less variation in concentration from the influence of temperature. He aimed at remedying the effect of the cold Manchurian winter on the axles of the Railway Car wheels of the South Manchuria Railway Company, which got ignited and damaged in consequence of the freezing of the axle oil applied thereto under the exceptionally low temperature over the northernmost sections of the Railway.

The deduction drawn by Mr. Tanaka out of his experiments is to the following effect:—

By mixing Bean Oil with axle oil for winter use, the latter's liquidity may be preserved at a far lower temperature than in the case of the axle oil itself. But, the efficacy of Bean Oil in this respect is below that of linseed oil, rapeseed oil, etc.

Needless to say, the proportion of Bean Oil to be mixed varies according to the kinds of the axle oil and also Bean Oil.

For specimens for experimental use, Mr. Tanaka has chosen (1) axle oil for winter use, manufactured by the Japan Petroleum Co., Ltd., (2) another kind of axle oil for use in the hot season, made by the same Company, (3) axle oil for winter use, made by the Vacuum Oil Co., and also (4) axle oil for winter use, manufactured by the Standard Oil Company of New York.

For mixture with each of the above mentioned specimens, Bean Oil, put out by the Nisshin Oil Mills, Ltd., Dairen, has been used; the rate of quantity having been separately fixed, and it has been found that the undermentioned mixtures are capable of withstanding a low temperature best:—

(1) 45% by weight of Bean Oil to axle oil
(2) 45.5% ,,
(3) 40% ,,
(4) 50% ,,

Hardened Oil.

From early times attempts have been made to obtain costly hardened oil from a liquid fat of comparatively moderate cost procured from oleic acid in

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liquid form, or olein made into stearic acid in solid form by more hydrogenation, but the addition of hydrogen to oleic acid or olein has been found exceedingly difficult, compared with a similar treatment of general organic compounds, and none of the numerous experiments has proved successful.

As late as 1886, Mr. Weineck (Astrr. Prioil. 10. 400,1886) invented how to reduce and harden oil by electricity, still he could not extend his invention to a commercially workable basis.

In 1896, Mr. Sabatier and Mr. Sendrens (Compt. rend., 132, 210, 560, and 1,254 Ann. de chim. et de Phys., 1905 (8) 4, 319-488) conducted study of different kinds of catalyzers and discovered incidentally the efficacy of pulverized nickel in hardening oil, thereby laying a foundation for the hydrogenation of oil.

Subsequently, the investigation of the same topic was vigorously carried on, and in 1902, and Mr. Leprince and Mr. Siveke (both German specialists) secured the first patents concerning the hardening of oil, and apart from them, Mr. Norman took a British patent on a similar process in 1903.

Mission Hospital of United Free Church of Scotland, Liaoyang, founded and superintended for 30 years by Dr. Alexander McDonald Westwater.

Later on, divers methods and appliances have been invented, and now the same subject has come to occupy a very important position in the industrial circles.

As regards the hardening of oil, Mr. T. Okada (*Rigakushi*) devoted himself to its study at the Central Laboratory of the South Manchuria Railway Company and managed to bring it to a stage of commercial workability, which resulted in the establishment of the Dai en Fat and Oil Industry Co.

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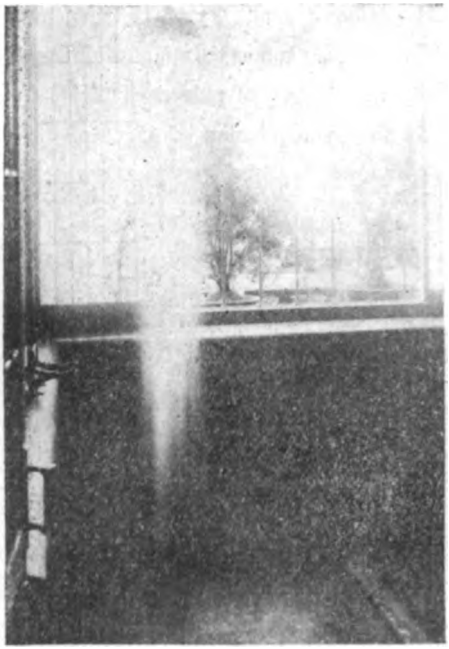
Recently, Mr. S. Uyeno has also taken up the study of the same problem, and has announced the progress of his labours as regards the hardening of Bean Oil to the following effect :—

Speed of Hardening Bean Oil.

Mr. Uyeno (757-763, No. 21, 1918, Journal of Industrial Chemistry) states that from experiments, he has learned that the reaction of the hardening of oil is of primary character, and that the speed of the reaction may be indicated by the undermentioned formula :—



Shower Bath in Hot Spring Hotel, Hsiungyocheng.

$$K = 1/t \text{ lu } a/(a-x)$$
$$K = 1/t \log a/(a-x)$$

In the above formulas, K denotes the speed constant in the reaction; x does the fall of iodine value from the hydrogenation; a iodine value of the oil; t the time wanted for the hardening of oil; and $(a-x)$ iodine value of hardened oil.

The same specialist has observed the extent of fall of iodine value by experiments, and, for trial, the value of K has been calculated, a sort of a constant value being obtained within the scope of the experimental error.

The properties and characteristics of Bean Oil used by him in his experiments are as follow :—

Colour	Pale yellow
Specific gravity (15° water 4°)	0.9243
Acid value	0.0
Saponification value	195.80
Iodine value	133.90
Refractive value (2°)	74.5°
Butter refractometer (2°)	1.4754

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Practical Experiments. Put 100 grammes of Bean Oil in a hydrogenator and add thereto 40 grammes nickel catalyzer. The results of observation at 100° in temperature are as under, the number of times the mixture was stirred, the quantity of hydrogen, and the degree of pressure being the same.—

t	$a-x$	$0.4343\ K.10^3$
0	133.60	—
30	126.30	0.846
60	121.40	0.709
90	117.70	0.629
120	116.70	0.500
180	108.60	0.505
240	97.74	0.570
300	86.74	0.627
360	74.57	0.706
420	68.26	0.697
480	64.28	0.664
540	58.69	0.663
600	55.07	0.643
660	49.07	0.661
720	45.30	0.654
780	42.55	0.638
840	23.13	0.908

The values of K kept pretty close within the scope of the experimental error. And the reaction of the hydrogenation is regarded as primary reaction.

Ratio Number of hydrogenation. It can hardly be called satisfactory to judge the degree of the hydrogenation of oil simply by its iodine value and melting point, since, even with the same kind of oil, its iodine values are varied.

Mr. S. Uyeno (p. 907, No. 21, 1918 Journal of Industial Chemistry) has produced the following relative formulas from the difference between the iodine values of the oil and the same oil on its final hydrogenation :—

$$X/a = n$$

a denotes the iodine value of the original oil, whilst X indicates the difference between the iodine values before and after the hardening. Mr. Uyeno has named "n" in the present case "the ratio number of Hydrogenation.

The hydrogenation is intensified as "n" approaches the integral number 1, the limit being reached in the following case :—

$$\text{Lim}\ X = a \quad X/a = 1$$

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The limit of an instance in which no hydrogenation has taken place at all from the very start being as under:—

$$\text{Lim } X = 0 \quad X/a = 0$$

When the degree of hydrogenation is to be compared, the ratio numbers of hydrogenation are held as very handy.

Catalyzer. As already mentioned, pulverized nickel is pronounced as most efficacious as catalyzer.

How to manufacture pulverized nickel may be mentioned under:—

(a) Nickel may be melted in sulphuric acid so as to make sulphate of nickel. Next by the action of carbonate of soda, it may be converted to carbonate of nickel. After it has got dry, it will be ignited and turned to oxide of nickel, then to be reduced by means of coal gas or some other reducing gas.

(b) A solution of sulphate of nickel may be treated with alkaline silicate. The precipitate may be dried and then be dried this time in a current of hydrogen. A catalyzer thus obtained may preserve its efficacy longer than what may be obtainable by an ordinary method, and on this account, it is better suited to the hydrogenation of oil. (J. G. Byron E. P. 133 2, 1913 J. Soc. Chem. Ind. 1914. 757).

Taisunkaku Hotel, Tangkangtzu Hot Springs.

Besides, there are numerous methods of manufacturing nickel catalyzers, but they are in essence identical.

Mr. S. Uyeno (p. 552. No. 18, 1915 Journal of Industrial Chemistry) has carried out close investigations concerning the hydrogenation of oil, also conducting sundry experiments regarding catalyzers.

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The substance of his report may be summarized under :—

As catalyzer, nickel was used on being precipitated on diatomite or pumice stone. A solution of nitrate of nickel, mixed with pumice stone or diatomite, was evaporated, and then it was ignited into oxide of nickel, then being reduced in a current of hydrogen.

A mixture of diatomite or pumice stone with nickel in suitable quantities is pulverized, and this is mixed with 100 grammes of Bean Oil, to be heated and stirred violently, and then to be hydrogenated.

The results are as follow :—

Ratio of catalyzing mixture			
Pumice stone...		3	—
Diatomite		—	1
Nickel		1	1
Catalyzer (as nickel)		2%	0 5
Temperature of hydrogenation		10° – 190°	190° – 200°
Time for hydrogenation		3.5 hours	2 hours
Hardened Oil	Appearance	White and solid	White and solid
	Melting point	39-42	51-53
	Iodine value	58.52	39.20

The use of diatomite is found generally to render the mixture to be filtered more easily than when pumice stone is used, in process of separating it from the oil after the hydrogenation.

Oxide of nickel of jet black colour and possessed of strong magnetic power, as obtained by the slow ignition of citric acid in the atmosphere is mixed with Bean Oil and is hydrogenated at 230°—250°, and white solid fat is obtained. Thus, the mere ignition of citric acid will quite do. In consequence, a catalyzer too, has been found ot play an effective part.

Catalysis and Durability of Nickel.

Several experiments have been made to study how the efficacy of a catalyzer preserved in different conditions is affected.

The results thereof are as under :—

In the above instance, the catalyzer has been made of diatomite and nickel in the same portion, 1% of nickel being mixed with Bean Oil.

In addition to the experiments mentioned elsewhere, a reduced catalyzer has been left standing in a bottle containing hydrogen for 209 days.

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The contents of the bottle have then been experimented upon Bean Oil.

No hydrogen is found left in the bottle. 1% of nickel is used with Bean Oil, and then this is hydrogenated for two hours at 190-200°. The hardened oil thus obtained has an iodine value of 69.13 and a melting point of 32°.

State of catalyzer preserved	Time for hydrogenation	Temperature of hydrogenation	Iodine value	Melting point
—	Bean Oil	—	136.24	liquid
Fresh catalyzer	1 hour	190-200°	96.66	31.0°
„	2 „	„	56.30	50.6°
„	2.5 „	„	35.30	58.2°
Exposed to the air for 22 hours.	1.0 „	„	84.00	36.6°
„	2.0	„	56.99	49.4°
„	2.5	„	45.11	51.8°
Left in bottle containing air for 17 hours	1.0	„	84.42	31.4°
„	2.0	„	51.14	54.4°
„	2.5	„	40.00	55.8°

The above experiments indicate the inconsiderable difference between the different states of a nickel catalyzer, whether fresh, exposed to the atmosphere for 22 hours, or in some other condition. The efficacy of the catalyzer remains impaired but little. On this account, industrially speaking, nickel need not be made fresh each time, but may be made in a large quantity, so as to be used in small lots as occasion requires. However, seeing that there is a limit to the period of efficacy, the catalyzer should be used as early as possible.

Chinese dyers.

Next, experiments have been made to test to what extent a catalyzer may be used repeatedly, with the following results:—

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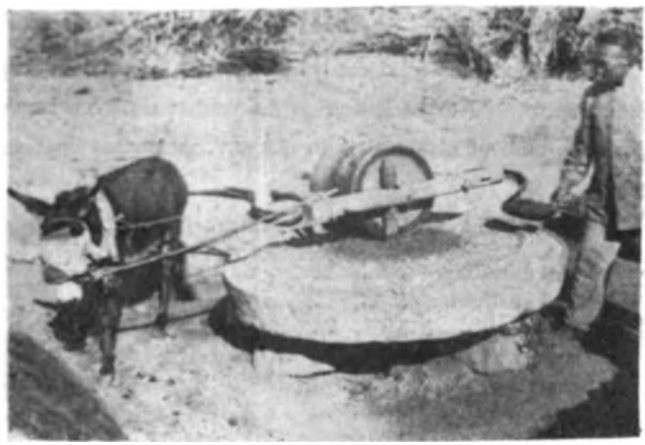
(a) A catalyzer made at the rate of 1% of nickel and 3% of diatomite is used with Bean Oil to hydrogenate it. Then, it is filtered, and from the residue, the oil is removed by means of a solvent, and the nickel is recovered. The same nickel has been used for hydrogenating purposes again, and, then after the nickel has been recovered for the second time, the hydrogenation process has been repeated, the results being as under :—



Kaoliang ground at home mill, Chinese Farm Yard.

	Hydrogenation			
	1st.	2nd.	3rd	Original oil
Time wanted	1.5 hours	1.5 hours	1.5 hours	—
Nickel as catalyzer... ...	about 1%	about 1%	about 1%	—
Temperature	190-200°	190-200°	190-200°	—
Iodine value	70.42	69.91	105.59	132.56
Melting point	32.2°	40.0°	liquid (in winter)	liquid

(b) After the nickel once used has been left alone, mixed with hardened oil, for six months, the hardened oil adhering to the nickle is extracted and the nickel is recovered. This nickel is used at the rate of about 1% to hydrogenate Bean Oil. Then, hardened oil of 88.69 in iodine value and 24.8° in melting point has been procured.

(c) The same nickel catalyzer recovered as mentioned in (b) is heated in a current of hydrogen. 1% of this is applied to Bean Oil, and this mixture has been hydrogenated under the same conditions as (b). As the result, hardened oil of 41.47 in iodine value and 48.6° in melting point has been procured.

From the above experiments, nickel is found good for repeated use a few times. It is also learned that the loss of catalyzing power resulting from being

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left in the hardened oil may be recovered by igniting it by the same method as when the catalyzer is made in a current of hydrogen.

Ratio and Efficacy of Nickel Diatomite.

The action of a solid catalyzer appears to depend in some measure upon its surface space, and to be greater as the contact surface is larger. Consequently, the larger the ratio of diatomite is in quantity, the more efficacious its power is thought to grow.

The following is the result of experiments :—

Nickel diatomite...	1-3	1-10
Nickel catalyzer...	1%	1%
Temperature	190°	190°
Time wanted	50 minutes	50 minutes
Iodine value	26.08	57.52
Melting point	43.0°	44.5°

When the first quarter of an hour is past, the hydrogenating process seems to be going on most actively, whilst the pressure in the hydrogenator shows a tendency of decline. For this reason, oil of medium hardness may be obtained in a comparatively short length of time.

Next, the use of a catalyzer made of nickel and diatomite used at the respective ratios of 1 to 10 has given the following results :—

	Specimen 1	Specimen 2	Specimen 3
Nickel catalyzer	0.3%	0.1%	0.1%
Temperature	185°-190°	180-185°	185-195°
Time wanted	1.5 hours	1.5 hours	1.5 hours
Iodine value	61.40	89.99	97.58
Melting point...	43-44	Sermi-solid like butter in spring	Liquid (containing a solid matter).

Remarks : Specimen 1, three days after the reduction of the catalyzer ; Specimen 2, four days after ; Specimen 3, six days after.

The above, too, appear to confirm the increase of efficacy with the increase of the ratio of diatomite to nickel (although perhaps subject to a certain range of scope). However, at the same time, with what contains a larger ratio of diatomite, the speed of decline in catalyzing power seems comparatively higher.

In the case of 0.5% of nickel as catalyzer, the results of practical experiments are as under :—

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0.5% of nickel catalyzer to Oil is found to have sufficient efficacy, provided it be fresh.

Nickel diatomite...	1-1	1-3	1-3
Time required	1.5 hours	2.0 hours	2.0 hours
Kinds of nickel used	What has passed 106 days after reduction.	fresh	fresh
Temperature	190-200°	190-200°	190-200°
Iodine value	86.45	63.66	57.34
Melting point	Solid (in winter)	40.4°	46.0°

Mr. Uyeno (p. 564, No. 18, 1915, Journal of Industrial Chemistry) has drawn the following conclusion from the above experiments:—

(a) Nitrate nickel is attached to either diatomite or pumice stone, and is made into an oxide by igniting it, being reduced in a current of hydrogen. The nickel catalyzer so obtained is black in colour and is highly magnetic.

1% of this is used with Oil, and in 2-3.5 hours, it is easily hydrogenated at 180°-200°.

The oxide of nickel made by igniting citrate nickel is of black colour and magnetic, being possessed of considerable catalyzing power.

(b) Nickel catalyzer preserves its catalyzing power for a long time. Even what has once been used is found serviceable repeatedly a few times over. Even though it may be left long in the hardened oil after it has served its purpose, it does not lose its catalyzing power. If washed in a solvent, to be liberated from the oil and then ignited in a current of hydrogen, it will greatly recover its efficacy.

(c) In catalysis, as to the ratio of quantity between nickel on one hand and diatomite or pumice stone on the other, the larger the latter is, up to a certain extent, the higer the efficacy seems to rise. In the case of the relative ratios being at 1 to 3, even the use of 0.5% of nickel will amply do, and, when the the ratio stands at 1 to 10, only 0.3% of nickel will serve the end. Even only 0.1% of nickel has been found enough to cause hydrogenation.

Hydrogenation at low temperature.

The following is the result of experiments conducted by Mr. Uyeno by the use of nickel and diatomite at the ratio of 1 to 3 (p. 560, No. 18, Journal of Industrial Chemistry, 1915):—

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	Original Bean Oil	1	2
Nickel catalyzer	—	about 5%	about 1%
Time wanted	—	1.5 hours	1.5 hours.
Temperature	—	120°	120°–140°
Iodine value	132.50	113.81	111.45
Melting point	Liquid	Liquid giving much solid matter	Semi-solid

There is only a trace of ash in hardened oil.

The above results show that Bean Oil admits of hydrogenation at a comparatively low temperature, and also that the same may be said of fatty acid. Therefore, in the manufacture of hardened oil as material for soapmaking, there is no need to remove the free fatty acid from Bean Oil.

Negative catalyzer in Hydrogenation of Bean Oil. Mr. S. Uyeno (p. 899-939, No. 21, Journal of Industrial Chemistry, 1918) has studied the effect on the hydrogenation of oil of the impurities that may be contained in the oil itself and also in the hydrogen.

In order to determine whether or not such impurities are a negative catalyzer, Mr. Uyeno has computed the ratio number of hydrogenation, to figure out the relation between this ratio number and the blank test, and when this number falls far below 100, its negative catalytic action has been accepted as remarkable, whilst if it goes far above 100, it has been regarded as aid to the catalyzing process.

The results of the experiments are as follow :—

Table 1.

Metallic Soap.

Objects of experiment	To oil	Nickel catalyzer	Melting point	Iodine value	X
Calium	1%	2%	37.0-38.9°	72.88	61.02
Natrium	1%	»	35 (dropping point)	76.49	57.41
Lithium	1%	»	47°.6	52.05	81.85
Calcium	1%	»	60.2°	10.47	123.43
Magnesium	1%	»	liquid	74.50	59.4
Strontium...	1%	»	62.6-63.4	21.48	112.42
Barium	1%	»	49.4	39.37	94.53
Aluminium	1%	»	62.60	20.69	113.21
Cerium	1%	»	61.60°	26.68	107.22
Iron (stearin)	1%	»	33-34°	78.38	55.52
Iron (oleic acid)	1%	»	45.4	57.33	76.57
Cobalt	1%	»	50.0°	42.46	91.44
Beryllium...	1%	»	semi-solid	82.90	51.0

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Object of experiment	To oil	Nickel catalyzer	Melting point	Iodine value	X
Nickel	1%	"	50.5°	26.06	107.83
Manganese	1%	"	61.4°	24.00	109.6
Chrome	1%	"	67.6°	34.77	90.13
Zinc	1%	"	49.0°	50.64	83.26
Cadmium	1%	2%	liquid	129.30	4.6
Copper	1%	"	65.6°	11.34	122.59
Lead	1%	"	liquid	132.00	1.9
Quicksilver	1%	"	17.0°	60.03	93.07
Silver	1%	"	—	16.17	117.73
Bismuth	1%	"	liquid	124.20	9.7
Vanadium	1%	"	59.0°	31.61	102.29
Tin	1%	"	41 42.2°	64.57	60.33
Thorium	1%	"	—	9.50	124.5
Uranium	1%	"	—	30.13	103.07
Gold	1%	"	40. 40.6°	64.76	69.16
Gold	1%	"	51.2-52.8°	42.73	91.17
Platinum	1%	"	62.0 73.4°	20.32	113.58

	$\frac{X}{a} \times 100$	$\frac{\checkmark}{v} \times 100$	Catalytic action	Degree of catalytic power
Calium	45.6	96.0	negative	
Natrium	42.9	62.1	"	
Lithium	61.1	6.80	"	
Calcium	92.1	104.3	Nil	
Magnesium	44.3	64.1	negative	Not much
Strontium	83.9	95.0	Nil	
Barium	70.5	78.9	negative	Not much
Aluminium	84.5	101.°	Nil	
Cerium	80.0	80.9	negative	Not much
Iron (stearin)	41.4	40.9	"	marked
Iron (oleicacid)	57.1	64.7	"	"
Cobalt	68.2	81.5	"	Not much
Beryllium	38.1	57.7	"	
Nickel	80.4	96.1	Nil	
Manganese	82.0	98.0	"	
Chrome	74.0	88.4	negative	weak
Zinc	62.1	70.3	"	
Cadmium	3.4	6.0	"	
Copper	91.5	103.8	Nil	
Lead	1.4	20.2	negative	strong
Quicksilver	47.7	54.0	"	
Silver	87.9	88.9	Nil	
Bismuth	7.2	10.9	negative	strong
Vanadium	76.2	86.4	Nil	
Tin	51.7	58.4	negative	weak
Thorium	92.8	93.8	Nil	
Uranium	77.4	78.3	"	
Gold	51.6	70.2	negative	weak
Gold	68.0	73.0	"	"
Platinum	84.8	95.7	Nil	

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In the above table, the metallic soap employed as the object of experiment has been used as stearic acid soap obtained by the fractionation of stearin made from tallow, except where otherwise specified.

The quantity used as stearic acid denotes the percentage to the oil.

Table 2.

Nickel Salts.

Objects of experiment	To oil	Nickel catalyger	Melting point	Iodine value	X
Acetic acid nickel	1%	2%	65.4–65.8°	13.11	120.79
Butyric acid nickel	"	"	41.2–42.0°	65.52	68.38
Lactic acid nickel	"	"	67.4–67.9°	4.36	129.54
Oxalic acid nickel	"	"	63.4–65.0°	17.57	116.33
Succinic acid nickel... ...	"	"	64.2–64.5°	17.08	116.82
Malic acid nickel	"	"	65.6–66.3°	10.61	123.29
Asparatic acid nickel ...	"	"	64.4–65.4°	15.24	118.66
Tartaric acid nickel... ...	"	"	63.8–64.6°	21.68	112.22
Citric acid nickel	"	"	65.2	15.28	118.62
Fumalic acid nickel... ...	"	"	42.0–43.0°	63.14	70.76
Benzoic acid nickel... ...	"	"	67.2–68.0°	2.32	131.58
Salicylic acid nickel ...	"	"	59.8–60.4°	40.34	93.56
Tannic acid nickel	"	"	65.6–66.4°	8.80	125.10
Cinnamonic acid nickel ...	"	"	68.0–68.4°	1.50	132.40
Resinous acid nickel ...	"	"	50.8–51.6°	46.91	86.99
Silicic acid nickel	"	"	64.9–65.1°	17.19	116.71
Carbonic acid nickel ...	"	"	68.3°	2.34	131.56
Boracic acid nickel... ...	"	"	liquid	133.10	0.8
"	"	"	"	128.80	5.1

Objects of experiment	$\frac{x}{a} \times 100$	$\frac{v'}{v} \times 100$	Catalytic action	Degree of catalytic power
Acetic acid nickel	90.2	91.2	nil	
Butyric acid nickel	51.1	70.5	negative	weak
Lactic acid nickel	96.8	97.9	nil	
Oxalic acid nickel...	86.8	87.8	"	
Succinic acid nickel	87.2	88.2	"	
Malic acid nickel	92.1	93.1	"	
Asparatic acid nickel	88.6	89.6	"	
Tartaric acid nickel	83.6	84.7	"	
Citric acid nickel	88.6	89.6	"	
Fumalic acid nickel	52.8	79.2	"	
Benzoic acid nickel	98.3	99.4	"	
Salicylic acid nickel	69.9	70.7	negative	weak
Tannic acid nickel...	93.4	94.0	nil	
Cinnamonic acid nickel...	98.9	100.0	"	
Resinous acid nickel	65.0	65.7	negative	weak
Silicic acid nickel	87.2	88.2	nil	
Carbonic acid nickel	98.3	99.4	"	
Boracic acid nickel	0.6	0.6	negative	strong
"	3.8	3.8	"	"

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Most of ordinary organic acid nickel salts show no negative catalytic action, and even if it is possessed of any at all, it appears to be only in an inconsiderable measure.

Table 3.

Inorganic Compounds.

Object of experiment	To oil	Nickel catalyzer	Melting point	Iodine value	X
Hydroxide of nickel	1%	2%	65.2°-65.6°	8.87	12.53
Hydroxide of copper (pulverised)	"	"	34.8°-35.4°	77.85	56.05
Oxide of zinc	"	"	62.4°-63.2°	23.14	110.76
Ferric oxide (Fe_2O_3)	"	"	45°-46°	54.44	70.46
Tungsten acid	"	"	48.5°-49.0°	49.19	84.71
Molybdic acid					
Ammonia	"	"	36.6°-37.4°	74.91	58.99
Arsenious acid	"	"	liquid	131.80	2.1
Silicic acid					
Aluminium	"	"	Semi-solid	83.97	49.93
Boracic acid	"	"	liquid	—	—

Object of experiment	$\frac{x}{a} \times 100$	$\frac{v'}{v} \times 100$	Catalytic action	Degree of catalytic power
Hydroxide of nickel	93.3	94.3	nil	
Hydroxide of copper (pulverized)	41.8	65.5	positive	weak
Oxide of zinc	82.2	92.8	nil	
Ferric oxide (Fe_2O_3)	59.3	63.8	negative	
Tungsten acid	63.2	90.1	nil	
Molybdenic acid				
Ammonium	44.6	69.0	negative	
Arsenious acid	1.6	2.2	"	strong
Silicic acid				
Aluminium	127.3	58.5	negative	
Boracic acid	—	—	"	strong

In the above table, the effects on common inorganic compounds have been given.

Table 4.

Organic Acids.

Object of experiment	To oil	Nickel catalyzer	Melting point	Iodine value	X
Acetic acid	1%	2%	67.4°-68.2°	2.43	131.47
"	"	"	64.2°-65.0°	16.32	110.58
Valeric acid	"	"	66°-66.9°	1.07	132.83
Caprylic acid	"	"	67°-97.8°	2.76	131.24
Capric acid	"	"	58.0°-58.8°	34.28	99.62

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Object of experiment	To oil	Nickel catalyzer	Melting point	Iodine value	X
Lauric acid	1%	2%	52.2°-53.0°	37.66	96.24
Myristic acid	,,	,,	61.0°-61.8°	26.99	106.91
Palmitic acid	,,	,,	67.4°-67.9°	4.00	129.99
Stearic acid	10%	,,	67°-67.5°	6.25	127.65
,, ...	50%	,,	—	52.35	81.55
,, ...	1%	,,	†60.2°-61.2°	75.73	58.17
Oleic acid...	,,	,,	67°-67.6°	4.54	129.36
Glycolic acid	,,	,,	semi-solid	87.45	52.45
,, ...	,,	,,	39.6°-41.4°	70.55	63.35
Lactic acid	,,	,,	semi-solid	78.14	55.76
Ricinoleic acid	,,	,,	,,	91.07	42.83
Dihydroxide (Stivic acid)... ...	,,	,,	59.6°-60.6°	31.96	101.90
*Tetra hydroxide (Stearic acid)...	,,	,,	liquid	112.60	21.30
Tetra hydroxide (Sativic acid). ,	,,	,,	45.3°-47°	58.96	74.91
Hexahydroxide (Stearic acid)...	,,	,,	liquid	121.30	12.60
Hexahydroxide (Linucic acid)...	0.5%	,,	50.3°-51.6°	41.84	89.06
Hexahydroxide (Linucic acid) ...	0.95%	,,	40°-48.4°	69.24	64.66
Oxi-acid obtained from sardine oil	1%	,,	liquid	130.50	3.40
Oxalic acid	,,	,,	,,	132.80	1.10
Succinic acid	,,	,,	,,	131.40	2.50
Fumalic acid	,,	,,	,,	128.90	5.0
Aspiratic acid	,,	,,	67.4°-67.8°	5.78	128.12
Citric acid	,,	,,	liquid	131.90	2.0
Polymerized rapeseed oil ...	,,	,,	44.2°-45.0°	56.49	77.41
Soda	,,	,,	38°-39°	70.33	63.57
Nucleic acid	,,	,,	63.1°-64.0°	18.40	115.50

Object of experiment	$\frac{X}{a} \times 100$	$\frac{V_1}{V} \times 100$	Catalytic action	Degree of catalytic power
Acetic acid	98.2	110.8	nil	—
,, ...	82.5	105.8	,,	—
Valeric acid	99.1	100.2	,,	—
Capryl acid	97.9	110.5	,,	—
Capric acid	74.3	112.6	,,	—
Lauric acid	71.8	99.9	,,	—
Myristic acid	79.7	110.1	,,	—
Palmitic acid	97.0	98.1	,,	—
Stearic acid	95.3	96.4	,,	—
,, ...	60.9	61.6	,,	—
,, ...	43.4	65.8	,,	—
Oleic acid	96.5	108.9	,,	—

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Object of experiment	$\frac{X}{a} \times 100$	$\frac{V^1}{V} \times 100$	Catalytic action	Degree of catalytic power
Glycolic acid	39.1	55.2	negative	—
„	47.3	59.5	„	—
Lactic acid	41.6	42.1	„	—
Ricinoleic acid	32.0	43.5	nil	—
Dihydroxide (Stearic acid) ..	76.0	76.8	negative	weak
*Tetrahydroxide (Stearic acid) ...	15.9	2.0	„	—
Tetrahydroxide (Sativic acid) ...	55.9	60.1	„	—
Hexahydroxide (Stearic acid)...	9.4	12.8	„	—
Hexahydroxide (Linuc acid) ..	66.5	71.5	„	—
Hexahydroxide (Linuic acid) ..	48.3	51.8	„	—
Oxi-acid obtained from sardine oil	2.6	3.5	„	strong
Oxalic acid	0.8	1.1	„	„
Succinic acid	1.8	1.8	„	„
Fumalic acid	3.7	3.7	„	„
Asparatic acid	95.6	96.7	„	—
Citric acid	1.5	2.0	negative	strong
Polymerized rapaceol oil .	57.8	79.7	„	—
Soda	47.4	50.6	negative	—
Nucleic acid	86.2	92.1	nil	—

† The reason for the melting point being remarkably high, compared with iodine value, is because of containing a large amount of stearic acid which has a high melting point

* Denotes the presence of impurity

Table 5.

Metallic Elements.

Object of experiment	To oil	Nickel catalyzer	Melting point	Iodine value	X
Nickel	1%	2%	63.8°-64.6°	18.24	115.60
Iron	„	„	59°-59.8°	34.74	99.16
Lead	„	„	49.6°-50.4°	47.22	86.68
Copper	„	„	46.8°-47.4°	9.61	124.29
Zinc	„	„	49°-49.8°	46.80	87.1
Quicksilver	„	„	liquid	71.38	62.52
Magnesium	„	„	liquid	115.80	18.1
Aluminium	„	„	63.8°-46.2°	18.88	115.02
Tin	„	„	66.2°-66.8°	7.50	126.40
Zirconium	„	„	61.0°-61.8°	24.57	109.33

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Object of experiment	$\frac{X}{a} \times 100$	$\frac{V_1}{V} \times 100$	Catalytic action	Degree of catalytic power
Nickel	86.3	97.4	nil	—
Iron	74.0	83.5	negative	weak
Lead	64.7	89.1	,,	,,
Copper	92.8	104.7	nil	—
Zinc	65.0	73.4	negative	weak
Quicksilver	46 7	52.7	,,	strong
Magnesium	13.5	20.5	,,	,,
Aluminium	85 8	96.8	nil	—
Tin	94.3	101.4	,,	—
Zirconium	81.6	92.1	,,	—

Table 6.

Sulphur Group and Compounds.

Object of experiment	To oil	Nickel catalyzer	Melting point	Iodine value	X
Sulphur	1%	2%	liquid	134.00	0
Selenium	,,	,,	,,	114.50	19.40
Tellrium	,,	,,	,,	96.25	37.65

Object of experiment	$\frac{X}{a} \times 100$	$\frac{V'}{V} \times 100$	Catalytic action	Degree of catalytic power
Sulphur	0	0	negative	strong
Selenium	14 5	22.0	,,	,,
... ...	28.1	44.0	,,	,,

Red phosphorus shows some catalytic action of negative character, but it is only inconsiderable. Neither does oxygen show any considerable catalytic action, when it is of a small quantity.

Table 7.

Albuminous Substances.

Object of experiment	To oil	Nickel catalyzer	Melting point	Iodine va ue	X
Hemoglobin	1%	2%	64.4°-64 8°	15.49	118 41
Protein	,,	,,	45.0°-45.9°	58.05	75.85
Blood albumin	,,	,,	52.2°-53.6°	37.89	96.01
Blood fibrin	,,	,,	46.4°-47.2°	50 60	83.30
Gelatine	,,	,,	—	56.87	77.02

Object of experiment	$\frac{X}{a} \times 100$	$\frac{V'}{V} \times 100$	Catalytic action	Degree of catalytic power
Hemoglobin	88.4	94.3	nil	—
Protein	56.6	60.4	negative	—
Blood albumin	71.6	72.4	,,	weak
Blood fibrin	62.2	79.5	,,	slight
Gelatine	57.5	79.3	,,	,,

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Table 8.

Organic Matters present in common as Fat

Object of experiment	To oil	Nickel catalyzer	Melting point	Iodine value	X
Glycerine	1%	2%	liquid	128.20	5.7
"	"	"	Semi-solid	66.97	69.3
Cholesterin	"	"	64.5°-65.2°	10.23	123.67
"	"	"	64.5°-65.0°	14.78	119.12
Lecithin	"	"	liquid	131.10	2.8

Object of experiment	$\frac{X}{a} \times 100$	$\frac{V'}{V} \times 100$	Catalytic action	Degree of catalytic power
Glycerine	4.3	6.7	negative	strong
"	51.7	58.4	"	"
Cholesterin	92.3	93.2	nil	—
"	88.9	100.3	"	—
Lecithin	2.1	3.2	negative	strong

Table 9.

Carbohydrates.

Object of experiment	To oil	Nickel catalyzer	Melting point	Iodine value	
Starch	1%	2%	47.7°-49.2°	50.93	82.97
Saccharose	"	"	liquid	92.49	41.41
"	"	"	35.6°-36.4°	67.75	61.15
Grape-sugar	"	"	liquid	123.70	10.20
Mannite	"	"	"	126.80	7.10
Glycogen	"	"	58.0°-60°	32.70	101.20

Objects of experiment	$\frac{X}{a} \times 100$	$\frac{V'}{V} \times 100$	Catalytic action	Degree of catalytic power
Starch	61.9	66.1	negative	—
Saccharose...	30.9	34.9	"	strong
"	45.9	62.4	"	"
Grape sugar	7.6	10.4	"	"
Mannite	5.3	7.2	"	"
Glycogen	75.5	80.6	"	weak

Table 10.

Alkaloids.

Object of experiment	To oil	Nickel catalyzer	Melting point	Iodine value	X
Antipyrine	1%	2%	42.8°-44.2°	57.99	75.41
Morphine	"	"	liquid	106.00	27.90
Strychnine	"	"	"	119.70	14.20

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Object of experiment	$\frac{X}{a} \times 100$	$\frac{V'}{V} \times 100$	Catalytic action	Degree of catalytic power
Antipyrine...	76.8	77.7	negative	—
Morphine	28.2	28.6	"	strong
Strychnine...	14.4	18.2	"	"

Table 11.

Other Compounds.

Object of experiment	To oil	Nickel catalyzer	Melting point	Iodine value	X
Cyano-potassium	1%	2%	liquid	133.4	0.5
Amygdaline	"	"	"	130.5	30.4

Object of experiment	$\frac{X}{a} \times 100$	$\frac{V'}{V} \times 100$	Catalytic action	Degree of catalytic power
Cyano-potassium	0.8	1.2	negative	weak
Amygdaline	30.7	30.7	"	"

Water No negative catalytic value is noticed in a marked degree.

Conclusions.

The conclusions drawn from the above experiments are as under:—

a) 1. The difficulty of hydrogenation varies according to the kinds of fat.

2. The hydrogenation of fat is an exothermic reaction, the degree of which varies according to the magnitude of iodine value, the difficulty of hydrogenation, and the freshness of the catalyzer.

3. The method of manufacturing catalyzers has a considerable effect upon the hydrogenating process.

b) 1. Alkaline metals are considered as negative catalyzers.

2. Alkaline earth metals show a negative catalytic action.

3. Earth metals, too, may be considered as negative catalyzers.

4. As to iron, its presence in a trifling quantity does not show a marked catalytic action, although it is a negative catalyzer when present in a large quantity.

5. Manganese may in most cases be regarded as negative catalyzer.

6. Chrome can scarcely be called remarkable in negative catalytic action

7. Neither ought colbalt to be accepted as a strong negative catalyzer.

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8. According to the results of experiments conducted on nickel salts, chlorides and sulphates are remarkable negative catalyzers.
9. Zinc and cadmium may be considered as negative catalyzers.
10. Copper shows negative catalytic action.
11. Lead, quicksilver, silver, tarium, bismuth, and antimony are negative catalyzers.
12. Arsenic may be a negative catalyzer.
13. Vanadium shows no negative catalytic action.
14. Tin, titanium, and zirconium each presents such as may put thereon the colour of a negative catalyzer.

    Thorium cannot be considered as a negative catalyzer.

    Neither uranium nor wolfram shows strong catalytic action.
15. Among gold, platinum, palladium, iridium, and osmium, none may be regarded as negative catalyzer.

c) 1. Among the halogen, chlorine and sulphides show strong negative catalytic action.
2. Sulphur and sulphides are originally strong negative catalyzers, but some of the catalyzers may be volatilized, and on this account little harm will be done.
3. Selenium is a negative catalyzer, but tellrium does not present strong negative catalytic action.
4. Cyanogen and its compounds give strong negative catalytic action.
5. Phosphor is burnt up, so it is a negative catalyzer, although its effect is not large.
6. Silicic acid is harmless.
7. Boracic acid is also harmless. In this point great dissimilarity is noted, in comparison when present in fat.

d) As to organic compounds which do not contain metals, what are treated at a high temperature are mostly harmless.

The above results deduced by Mr. Uyeno by his investigations are considered as highly important in the selection of materials for the manufacture of hydrogenating equipments and also the manufacture of catalyzers.

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Characteristics of Hardened Oil.

Needless to remark, hardened oil is possessed of different characteristics from original Bean Oil.

The following are their comparative properties (E. Mettena, Anali Chem. April, 1914, 1381):—

	Hardened Oil	Bean Oil
Melting point	68°	7°–8° (Keimatsu)
Saponification value...	190.9	192.62 (Tsujimoto)
Iodine value	15.2	132.50 (")
Melting point of fatty acid ...	66.0°	26.0° (Nishiyama)
Freezing point of fatty acid ...	61.2°	22.5° (")

Kinds and uses of hardened oil. From the difference in the degree of hydrogenation, hardened oil of varied hardness may be obtained. Consequently, oil may be hydrogenated at a suitable degree according to the uses for which it is intended.

Hardened oil is used principally as food and also materials for making soap, stearin, etc.

Oil. As Bean Oil is semi-drying, it is liable to get oxidized slowly in the air and to form a film. So it is available as material for making paints. Still the film formed by Bean Oil alone is very flimsy, and moreover it takes a long time to get dried. Therefore it may be found to be to advantage to mix linseed oil or yemola oil with it.

Mr. Gardner (H. A. Gardner. Circ. No. 69. Paint Manufas. Assoc. of U. S., Aug. 1919, p. 12) reports as follows as regards desiccator to be used with Bean Oil:—

Either crude or refined Bean Oil, mixed with crude linseed oil, may be mixed with lead, manganese, cobalt, or zinc, or linolenic acid salt of any of these mentioned above or resinous acid, and may be caused to form a thin film on a piece of glass or a wooden board.

From this, the following deduction is made:—

1) By the use of a suitable desiccator, even crude Bean Oil may get dried with almost the same quickness as boiled linseed oil.

2) If the mixture is heated, the drying process may be further quickened, and the mixture becomes more sensitive to the action of the desiccator.

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3) In case of cobalt, manganese, or lead being used by itself, the maximum quantity to be used is 0.3%, 0.7%, and 0.5% respectively.

4) The best desiccator to be used with Bean Oil is found to be linolenic acid.

5) Both cobalt and manganese are liable to form a hard thin film. On the contrary, lead and zinc seem inclined to form a thin film, somewhat softer and more elastic. Therefore, the mixed use of the two is recommended.

6) In order to realize the finest results in the drying process, the desiccator may be prepared at the following rates:—

Metal	A	B
Manganese	0.03%	—
Lead	0.01%	0.2%
Cobalt	0.01%	0.02%

Mr. M. Tsujimoto (p. 226, No. 7, 1904 the Journal of Industrial Chemistry) has published the results of his investigations of boiled Bean Oil as follows:—

The object of his experiment was put out at Tokushima (Shikoku, Japan) and it was refined with 10% by weight of Kanbara clay (produced at Kanbara, Echigo Province). Crude oil, because of the presence of impurities such as viscous matter, takes too long a time for it to get dried for practical purposes.

Mr. Tsujimoto has made boiled oil by the two following methods:—

First method. It is by heating Bean Oil at between 130° and 140° for three or four hours. The desiccator may be applied either at the start or at the close, according to its kinds.

Second method. It is by heating Bean Oil with the desiccator at 230°-270° for three or four hours.

By the above mentioned methods, the following four kinds of Boiled Bean Oil have been made experimentally:—

	Specimen 1 (by First method)	Specimen 2 (by First method)	Specimen 3 (by Second method)	Specimen 4 (by First method)
Desiccator	Litharge	Boracic acid manganese	Boracic acid manganese	Resinous acid manganese
Quantity of above used	2.0%	1.5%	1.5%	1.5%
How used	Applied at the start	Applied at the start	Applied at the start	Applied when the heating is ended.
Characteristics	Yellowish brown; almost black in reflected rays; has somewhat low viscosity	Yellowish red; has low viscosity	Almost black; highly viscous	Light red; has low viscosity.

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The boiled oil thus obtained has been put on a piece of glass in a thin coat, and the time required for drying to the extent that a light pressure with a finger causes no oil to stick to the finger has been examined, the results of examination being as follow:—

	Specimen 1	Specimen 2	Specimen 3	Specimen 4
After 12 hours	Not yet dry	Not yet dry	Not yet dry	Not yet dry
„ 18 „	Still sticky	Dried	Dried	Nearly dried.
"24"	Dried somewhat imperfectly			Dried
Colour of film	Light brown	Colourless	brown	Colourless
State of dryness	Drying quality imperfect; as the oil is coloured, the drying film, too, is coloured.	excellently dried	as the oil is strongly coloured, the drying film, too, is coloured.	Pretty well dried.

Specimens 2 and 4 of boiled Bean Oil gave fine drying showing, whilst Specimens 1 and 3 were inferior, in point of their being coloured. Moreover, as to Specimen 1, it betrayed the drawback of drying only imperfectly.

Fundamentally, boiled Bean Oil must get dry in from four to twenty-four hours, which condition is fulfilled by Specimens 2 and 4, still their drying film is far more flimsy than what is formed by linseed or yemola oil, and is liable to get damaged readily.

Next, in order to test the drying film formed when the boiled Bean Oil has been converted into a paint, pigment has been added, and after kneading the mixture up well, it has been diluted to a suitable degree with turpentine. This has been put on a wooden board or a piece of glass, the results being as under:—

Kind of pigment	Boiled oil to pigment	Drying and film.
Zinc white	22 %	Perfectly dried in 24 hours, the film being milk white and hard.
Red lead	10 %	Only imperfectly dried on the lapse of 24 hours. Perfectly dried in 30 hours, the film being practically hard.

Thus, boiled Bean Oil, mixed with pigment, may form a somewhat hard drying film, which is, however, considerably inferior to what is obtainable from other drying oil.

Mr. Tsujimoto's deduction from the above experiments may be summed up as follow:—

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Bean Oil, when refined and made into boiled oil, will give oil capable of getting dried within twenty-four hours.

As desiccator, boracic acid of manganese, resinous acid of manganese, or some other efficacious desiccator is desirable. The temperature should not be raised above 200°, for once above 150°, a gas emitting an offensive smell will be generated, and when it goes above 200° and the desiccator is still left, the product will be found to get strongly coloured.

The drying film of boiled Bean Oil is by itself so flimsy as to get easily damaged, but if made into a paint by the mixture of a pigment, the film will grow much harder, still its hardness is much inferior to what is formed with other boiled drying oil. Further, a longer time is required for drying, and the product is of poor quality, into the bargain.

Mr. S. Nishiyama (p. 765, No. 11, 1908, the Journal of Industrial Chemistry) has also studied the very same subject.

He has added 2% of desiccator to Bean Oil, heating it for three hours at about 150°, the results being as under:—

Desiccator			Boracic acid manganese	Resinous acid manganese
Its quantity to oil		2%	2%	2%
Characteristics and drying property	Light brown; slow to get dry; has got dry only in three days.	Somewhat darker; shows little viscosity; has got almost dry in 30 hours.	Lightest in colour; has little viscosity; has got dry only after 30 hours.	Red brown in colour; has much viscosity; and has got dry in 24 hours.

From the above, by the use of resinous acid of manganese, boiled oil that gets dry within twenty-four hours, may be obtainable, but its film is very flimsy and far from fine.

The results of experiments by the two specialists above mentioned demonstrate that any boiled oil made form Bean Oil alone appears to be of indifferent quality.

Mr. Nishiyama (p. 766, No. 11, 1908, the Journal of Industrial Chemistry) has found by experiments to what extent Bean Oil may be used as substitute for linseed oil in making boiled oil, the results being as under:—

Linseed oil	70	60	50	40
Bean oil	30	40	50	60
Resinous acid manganese	2	2	2	2
Boiled oil	Dry in 10 hours	Dry in 12 hours	Dry in 12 hours	Dry in 16 hours

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The above shows that at least the same quantity of Bean Oil may be used as substitute for linseed oil without much impairing the drying property, since the time required for drying is short, and the drying film, too, is comparatively hard.

Therefore, boiled Bean Oil is available as adulterator for boiled linseed oil, and if a more powerful desiccator is available, the production of boiled oil by itself may not be a mere dream.

Oil with blown in air. When Bean Oil is heated and has air blown there into, it will get gradually oxidized and will have its specific gravity and viscosity increased, producing what is called air-blown-in oil. But as the oxidization of Bean Oil is comparatively slow, the reaction will not be kept up by simply heating it at the start, but it requires a continued heating, while air is being blown in. By this means, the specific gravity may be very easily increased to 0.94-0 95.

The oil with air thus blown in and having specific gravity and viscosity increased is good principally for lubricating purposes, but this variety of oil takes only from three to five days to get dry, while ordinary Bean Oil does from five to six days. So, it is also available as paint.

Mr. Millian Toch (Mar:—Millian Toch: J. Soc. Chem. Ind. 1912, 572) says that he has found that some Bean Oil, if heated at 260° for two or three minutes, gets bleached remarkably, and if dry air is blown thereinto for from five to seven hours, it will get thicker, with 0.96 or above in specific gravity. Such oil is available as paint.

Mr. S. Nishiyama (p. 764, No. 11, 1908, the Journal of Industrial Chemistry) has studied the changes in property that have come over Bean Oil which has been heated to 180° and has had air blown in.

The results are as under:—

Oil	Specific gravity	Iodine value	Acid value
After air has been blown in	0.9243	134.37	0.55
two hours	0.9312	128.59	—
four hours	0.9347	125.92	—
six hours	0.9376	125.71	—
eight hours	0.9410	125.10	—
ten hours	0.9421	124.52	1.08

When, at the temperature of 200°, air has been blown in for seven hours, specific gravity is found to advance to 0.9531.

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Contrary to the results of Mr. Nishiyama's experiments, Mr. Toch is reported to have found, in experimenting upon Manchurian Bean Oil, that when air has been blown in, it has considerably lost in acid value.

Oil with air blown in is available not only for lubricating and painting purposes, but also for making linoleum cloth, printing ink, etc. As the cost is low, it may be turned to other commercial uses, and this subject is believed to merit further attention.

(Concluded)

TRADE & INDUSTRY.

Timber Rafting Traffic.

On the Yalu.

The timber rafting traffic, as carried on by the Yalu Timber Co., under Sino-Japanese joint management, has increased annually. The last fiscal year of 1921 holds the highest record for the traffic, the total number of rafts going above 10,000, worth Y15,000,000.

The following gives the data of the annual outputs for these ten years:—

	Logs	Value in Chenping tael
1912	856,285	Tl. 1,630,487
1913	558,725	1,340,107
1914	1,725,048	3,222,345
1915	1,095,331	1,941,227
1916	1,607,206	3,378,758
1917	1,713,911	3,508,452
1918	2,086,017	6,175,414
1919	2,335,914	7,000,213
1920	2,335,592	6,420,567
1921	4,063,172	9,092,725

Rafting Traffic and Weather and Water Conditions.

In 1912, there occurred two floods, but both water and weather conditions were favourable, but in the early part of the fiscal year, the Revolutionary dis-

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turbances in China had not yet ceased, making it difficult for timber dealers to forecast the market prospect about Tientsin, which is one of the chief consumers of Yalu timber. Moreover, all along the Upper Yalu, rinderpest broke out, interfering considerably with the transportation of timber. These circumstances reduced the outputs.

In 1913, not a rain fell from early summer to autumn, causing one of the worst droughts known. This naturally brought down the timber arrivals at Antung very low.

In 1914, plenty of rain was had, in contrast with the preceding year. There were indeed a few floods, but the timber returns were very satisfactory.

1915 had frequent rains, giving ample water. However, due to the business dullness, aggravated with a general depression, the timber outputs were curtailed.

In 1916, in spite of insufficient rainfall, the weather conditions were otherwise favourable. As the demand for timber rose and the prices thereof, too, advanced, effort was exercised for the transportation of timber, with passable returns.

In 1917, the summer was rather dry, and much difficulty was met with in the conduct of the timber traffic. As the water condition was improved in autumn, the arrivals at Antung were brisk, with the market tone keeping lively.

1918 saw a very busy season owing to the good water condition.

In 1919, there was a bad flood in spring; the summer was dry causing the River to shrink up and suspending the timber traffic entirely; there was good rainfall in autumn, and, as the market temperament was responsive, the season proved quite a profitable one.

In 1920, considerable timber felling was executed in the forests, but there was only scanty rainfall on the whole, cutting down the rafting facility. Still, by dint of effort, fair results were reaped.

1921 had a most favourable season from the very beginning right through to autumn. The weather and water conditions were both the most auspicious. Further a good deal of timber felled in the previous season had been left over, and this, too, was rafted down, giving by far the most prosperous returns.

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Hold-Over at end of 1921.

Last year proved the record one for the rafting traffic on the Yalu since the Yalu Timber Co. came into being. In timber business, too, a large quantity was exported in the directions of Shantung, Chosen, and Japan.

At the end of 1921, the stocks held by the dealers at Antung totalled 1,592,453 pieces, more than twice over compared with 760,000 pieces for the end of 1920.

Out of the above hold over, 203,832 pieces had already been bargained off, and the balance of 1,388,621 pieces may be classified as under:—

Owned by Yalu Timber Co.	208,204 pieces.
Held as security for loans advanced by Y. T. Co. ..	104,281 „
Held by Japanese dealers	242,192 „
„ Chinese „	733,954 „

It may be mentioned that, the stocks held by the Japanese dealers included what was set apart for paper making material by the Yalu Paper Mill, Ltd., and what had already been consumed as such material, leaving the net timber stock of some 170,000 pieces available for sale.

Labour Scale at Dairen.

Sharp Fall Observed.

The labour scale at Dairen during January, 1922, according to the investigations of the Bank of Chosen, the average indices were 214.94 for Japanese and Y1.5953 for Chinese, the grand average indices being 207.24, being a decrease by 129.88 and 179.72 for the Japanese and Chinese respectively, compared with the figures for the same month of the preceding year, and also a decrease by 124.18 and 133.76 for the Japanese and Chinese respectively in the previous month, as may be seen from the following:—

	January, 1922	December, 1921
Japanese	214.94	339 12
Chinese	159 53	293 29
Grand average	207.24	310.21

It may be mentioned that the data prevailing in August, 1915, is taken for 100, the standard, in all the above tables.

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How such a sharp fall was noted compared with the previous month was partially due to the steady decrease in the demand for labour in consequence of the prolonged dullness in building enterprise, and partially because the economic conditions on the turn of the year proved rather disappointing.

The following table gives the principal trades and daily wages for the same :—

	Japanese	Chinese
Carpenters	¥3.20	¥1.00
Masons	3.80	1.50
Stone masons	3.20	1.00
Sawyers	3.20	1.00
Bricklayers	3.20	1.00
Tile roofers	3.00	1.00
Glaziers	3.00	1.00
Mat-repairers	3.20	1.00
Joiners	3.20	1.20
Painters	3.00	1.00
Blacksmiths	3.00	1.00
Paper-hangers	3.00	1.00
Tailors	2.80	1.00
Labourers	1.50	0.50
Compositors	2.50	1.00

Especially such as carpenters, masons, stone-masons, etc. directly connected with building work, suffered most heavily. Japanese carpenters and Chinese masons had their daily earnings decreased by 80% compared with the previous month.

SHIPPING NEWS.

Junk Trade in Kwantung Leased Territory.

The junk trade focalized at Dairen and Pitsuwo in 1921 showed a tendency of more or less decline compared with the days when the silver exchange rate was at its zenith, but, as far as the total of the import piculs is concerned, the figures for the same year exceed those for each of the two preceding years, 1919 and 1920.

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The number of the junks engaged in both export and import during the last five years, together with the cargoes carried in piculs, are as under:—

Kwantung Leased Territory.

	junks	piculs
1917	2243	551,709
1918	9216	737,280
1919	8403	491,718
1920	7144	385,537
1921	6606	404,383

Antung.

1917	673	47,167
1918	1243	94,420
1919	920	103,213
1920	497	42,853
1921	475	37,163

Newchwang.

1917	12	2,075
1918	20	2,321
1919	144	14,696
1920	121	12,457
1921	12	2,900

Tientsin.

1917	133	22,865
1918	275	22,011
1919	216	22,453
1920	282	28,010
1921	253	32,530

Shanghai.

1917	129	36,535
1918	116	33,000
1919	94	24,895
1920	99	24,100
1921	125	54,780

As to the data for Weihaiwei, Chefoo, and Lungkou, and also the coast ports in the two Provinces of Chihli and Fengtien, they were also fairly large, their totals coming up to the following:—

	junks	piculs
1917	22,954	2,286,000
1918	24,720	2,078,700
1919	17,573	1,431,000
1920	19,133	1,529,000
1921	17,935	1,606,000

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The chief articles carried by the junks were Beans, Bean Cake, Bean Oil, and kaoliang and other cereals.

The port of Lungkou, which had had an unusually prosperous junk trade since it was opened in 1916, was concerned chiefly in the export of stone. The port of Antung, as is well known, has timber as its foremost export. As to Pitsuwo and the Elliot Group, their chief exports are fish and other marine products to South China.

Whilst the junk trade of Canton, Amoy, Swatow, Foochow, and other South China ports, and also of Formosa has been attracting the attention of the public, that of North China has received only scanty notice.

The exports and imports of the Junk Wharf, Dairen, for one year from October, 1920, to September, 1921, amounted to about 400,000 tons.

Especially, as China has striven to boom the junk trade on her own volition in order to foster her domestic trade and industry, it has been growing by degrees, as may be evidenced by the steady development of the port of Lungkou.

If the silver exchange rate should rise again, it will enliven the junk tarffic along the China coasts.

MANCHURIA ENLIGHTENING SOCIETY.

Whose Organ the "Light of Manchuria" is

What actuates us in our endeavours to open up Manchuria and Mongolia lies in realizing our ultimate ideal in the enlightenment and development of Manchuria and Mongolia. It will not do only to develop the natural and industrial resources, but the ethical and intellectual culture of the inhabitants must also be carefully husbanded and nourished, so that both mind and matter may be developed in harmony.

The Manchuria Enlightening Society raised its first cry in order to fill a sorely felt need. Its primary mission is to investigate and propagate the truths of the development of Manchuria and Mongolia. We shall studiously refrain from misleading the public by disseminating inaccurate or exaggerated reports, but shall steadfastly adhere to the truth or facts only.

It is urgently important that the truths regarding Manchuria and Mongolia should be made known clearly not only to Japan and China, but also to Europe and America. On this account, the establishment of the Manchuria Enlightening Society is deemed to have a serious significance of international character.

If happily through the establishment and activity of this Society, the truths of the development of Manchuria and Mongolia should become topics of world wide interest, it would not be only an honour to those now actively engaged in developing these regions, but also a matter of

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congratulation to the world at large.

We might be permitted to add that the ultimate ideal and desire of this Society are to serve as the herald of all enlightening movements in future, thereby opening a new chapter in the annals of the world's civilization.

What is the Society Like.

a) Office.—The office of the Society is in the Municipal Office Building on Central Circle in the city of Dairen.

b) Society's Work.—The works of the Society include the following:—

1. Publication of the organ of the Society, The "Light of Manchuria."

2. Supply of general information through the Society and by other means, giving the results of such investigations and researches as may be conducted in the interest of the development of natural, industrial, and other resources in Manchuria, Mongolia, and Eastern Siberia.

3. To act as guide to intending investors in general in all kinds of enterprises in Manchuria, etc., and also to undertake any special investigation or research on application by promoters of all kinds.

4. To offer facility to travellers on inspecting visits to Manchuria, Mongolia, Siberia, Chosen (Korea), China, etc., to the end of imparting accurate information and rendering their observations as close to truth as possible.

5. To use all kinds of means in order to propagate the true conditions obtaining in Manchuria, etc., and further to carry on the propaganda work for these regions through the medium of lecture meetings, exhibitions, etc.

6. To compile, publish, sell, and distribute books, pamphlets, etc., bearing on Manchuria and Eastern Siberia.

7. To carry on other works necessary for disseminating information on Manchuria, etc., and also for fostering economic enterprises therein.

c) In carrying on the above work, the Society is divided into the following:—

Secretariate,
Research Department,
Publication Department,
Intelligence Department, and
Accounting Department.

d) Any one wishing to join the Society is requested to send in a written application, giving the name and address, accompanied with the membership fee for not less than three months paid in advance.

e) The membership fee, entitling the member to a copy of the monthly organ, costs 50 sen (½ yen) per month and ¥6 per annum.

Remittances.

All remittances to this Society may be made most conveniently and safely to Transfer Savings No. 2850, Dairen. No receipts for the same will be issued, but instead the Society's monthly organ will be sent.

Officials.

Baron S. Goto (Mayor of Tokyo), President.

Mr. S. Hayakawa (President, South Manchuria Railway Company), Chairman;

Mr. Y. Aoi (Chairman, Chamber of Commerce, Dairen), Vice-Chairman;

Mr. Y. Matsuoka (Director, South Manchuria Railway Company), Vice-Chairman;

Mr. H. Kasahara, Secretary.

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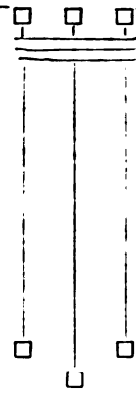

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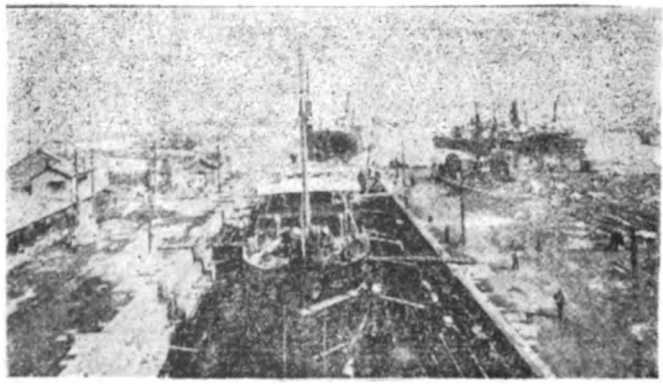

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THE

LIGHT OF MANCHURIA

BEAN INDUSTRY AND ITS SCIENTIFIC STUDY.

By Mr. Y. Sato,
of S. M. R. Co. Agricultural Office.

Article after article has been published on Manchuria (Soya) Beans and their utilities. These problems concern us so seriously. It may be said that the rapid development of the economic Manchuria has been accelerated by Beans. The future of the Manchurian industry may well be said to depend a good deal on Beans.

The development of Bean cultivation and industry ought to be studied from different standpoints, and calls for the co-operative effort of the agricultural, industrial, commercial, and financial circles.

For my present purposes, I should like to dwell on the urgent necessity to base Bean industry upon science.

However, as regards bean milling (that is the manufacture of Bean Oil and Cake from Beans), which forms the principal feature of Bean industry in Manchuria, I intend to write an article separately and not to touch the same in the present one.

I. Bean Industry.

A. Utilization of Fat and Bean Oil.

Up to comparatively recent days, some oils of animal and vegetable origins have been regarded as good for industrial uses, whilst other kinds have been for food, the line having been drawn pretty distinctly between industrial and edible oils.

This distinction was mainly due to want of scientific knowledge concerning the properties of each kind and its scientific treatment. But there is no denying the geographical relation having played a part.

For instance, the inhabitants of the Temperate Zone used to mix whale oil with insecticidal sprays, whilst cocoanut oil was used almost exclusively for the manufacture of tinplate and other industrial purposes. The Esquimaux in the

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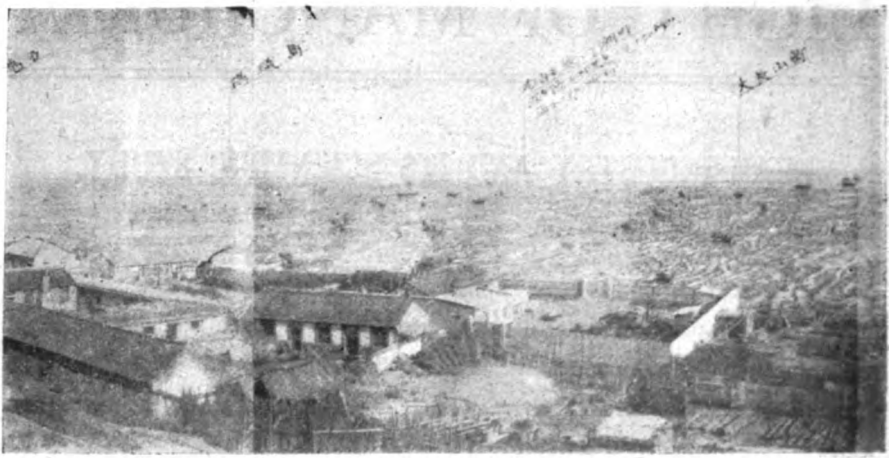

Beach in front of the Town of Pitsuwo

Arctic Zone take whale oil daily as an article of food, whilst the African natives in the Tropics keep food stuffs in cocoanut oil.

In Great Britain, the United States, etc., linseed oil and sunflower oil have been looked upon as the most essential drying oil indispensable to paint industry, while the Russians have used them as food.

These distinctions above mentioned originated from geographical considerations, but nonetheless the line was drawn distinctly enough.

The advance of science in recent times has quickened the development of the methods of refining, deodorizing, decolouring, and hydrogenating fat and treating it otherwise.

As the result, the partition that used to divide food oils from industrial oils has come to a collapse all round. Whale oil and fish oil, when hydrogenated, are in use in Europe and America as a regular constituent of oleomargarine. Even at present, there are still a few kinds of oil, inclusive of castor oil, that are regarded as unfit for food.

However, that almost all kinds of oils that were formerly treated as not edible have come to be utilized for food is owing to the wonders wrought by science.

But, the statement that almost all kinds of fat are available as food should not be misconstrued as saying that all such oils should be used as food indis-

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(in the northeast of Kwantung Leased Territory)

criminately now and in future. In fact, certain kinds of fat, from both chemical and economic considerations, should better remain for industrial uses.

For example, such as linseed oil and paulownia oil that are possessed of superior drying property may be used to greater advantage for paint-manufacture than as substitutes for lard, butter, etc. Then, cod oil and castor oil are better suited to be used as medical oils. Next, certain kinds of oil are economically unworkable to be subjected to the high degree of refining process necessary for their conversion into palatable food stuffs.

That Bean Oil was introduced to the world's oil market dates back only a dozen years or so. Until that time, it had been utilized by the natives of Manchuria (in a corner of China) as an article of food, a source of light, lubricating oil, etc. The field of demand did not go outside China. The bean milling, too, was carried on by means of out of date primitive devices on a very small scale, which were worked by hand or else by the use of a draught animal.

At the time when Manchurian Bean Oil was presented to the European market for the first time, it so happened that the supply of solid animal fat had run short, and how to make up for the deficit of food fat was racking the brain of those interested, and, as above stated, the kinds of vegetable and fish oils which had never been thought of as edible, had come to be used extensively as substitutes for edible oils, and new sources of oil supply were being sought.

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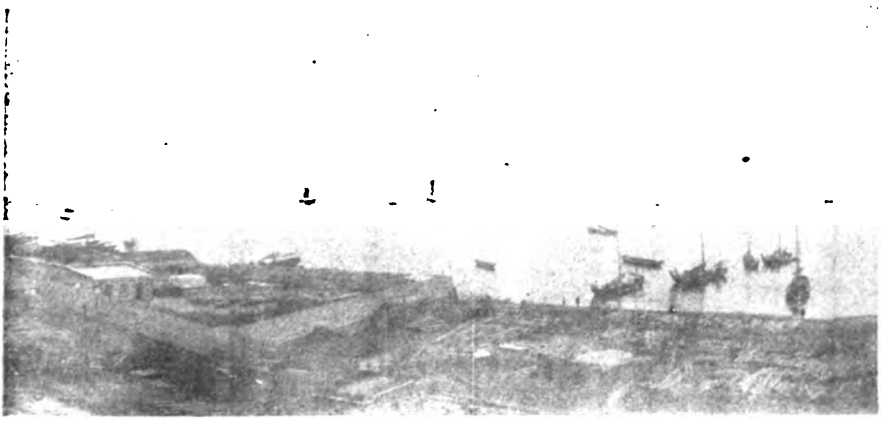

Town of Pitsuwo

When Beans were introduced to the Western Markets, they rapidly rose in popularity as they proved themselves not only good to eat, but also because Bean Oil was found excellent for industrial and food purposes all round, besides being moderate in price.

The chief directions, in which liquid fats such as vegetable, whale, and fish oils extended their utility into the legitimate scopes of other animal oils by reason of their short supply and dear prices, have been as substitutes for oleomargarine and lard substitutes, thanks to the triumph of science in refining liquid oils and hydrogenation, as already stated.

Bean Oil, on the Western markets, is employed mostly in the same directions.

Bean Oil is also mixed with cocoanut oil, palm-kernel oil, etc.

Originally Bean Oil is used as an edible by the Chinese, but the strange smell possessed thereby has repelled the Japanese and Western palates, until only recently, it has come to be subjected to sundry deodorizing and refining methods, fit to be used as substitutes for such superior kinds as olive oil, salad oil, etc. Thus, Bean Oil which used to be employed for cooking purposes by the natives of what was regarded as the out of the way part of China, Manchuria, has leaped at a bound into the forefront of the world's market as a fine article of food in the comparatively short space of a dozen years or so.

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(at Flood Tide)

Seen from an industrial point of view, the shortage of linseed oil, which has been looked on as essential for paint making, and the rise in its price have caused Bean Oil to be used for mixture as partial substitute.

This has been made possible by another achievement of science in imparting to Bean Oil, a semi-drying oil, properties kindred to such drying oils as linseed oil, etc., by means of blowing air thereinto, a drier, or some other scientific operations.

Again, as soap making material, Bean Oil is mixed with tallow, cotton seed oil, cocoanut oil, etc., and further its uses are being extended steadily in other directions.

Bean Oil ranks between industrial and edible oils, and is dissimilar from linseed oil in its relation to paints and cotton seed oil as material for making oleomargarine.

Since its uses are varied and their scope is extensive, its future must be considered as very promising.

Turning to linseed oil for paint making and cotton seed oil for making oleomargarine, each has had a long history and all conceivable kinds of experiments and tests have been executed regarding their utilities and properties.

Bean Oil is a new oil, and besides its uses are varied, requiring fresh investigations for each kind of use. What is in vogue is to be improved, and new plans of treating it must be devised.

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From this point of view alone, if Bean Oil is to be established in the uses exploited so far and is to be further developed, a systematic scientific study concerning the utilities of Bean Oil is considered as necessary.

B. Refining of Bean Oil.

Crude Bean Oil obtained by either expression or chemical extraction, whether for industrial or edible purposes, stands in need of more or less refining.

The degree of refining varies according to the objects in view, but in a general sense, the following operations are included :—

1. Elimination of albuminous and other organic matters.
2. Elimination of moisture.
3. Elimination of free fatty acid.
4. Bleaching by either the destruction or removal of the colouring matter.
5. Deodorizing.

Bean Oil put out from the Bean mills in Manchuria is being exported to the West without undergoing refining worth the name.

For instance, crude Bean Oil is stored merely in a large tank to be left standing for a few days, so as to let part of the precipitate (about 1% of the whole) settle. Then the clear part is taken and is shipped away as merchandise. At times, the storage tank is heated by indirect steam, in order to accelerate the precipitation of impurities. Still, the substance of these processes is to leave the oil still, and curious as it may appear, the major portion of the free fatty acid, organic matters, albumen, and water constituting the impurities contained in the oil may thus be removed, although, as might be expected, only partially.

The presence of organic and albuminous matters, water, organic acids, etc., in Bean Oil hastens decomposition, increases the free fatty acid, and markedly deteriorates the quality. The same action takes place sensitively even in the event of the impurity contained therein being in only a small quantity. However, Bean Oil, which has been clarified only by leaving it undisturbed, will get turbid as time passes by, will become decomposed, and is liable to show an increase in the free fatty acid.

Fresh Bean Oil has a sweet smell, but, when the impurity is contained in a large quantity, it will emit a disagreeable odour resembling the smell of sugar in a few days' time. As time goes by, the change will grow more pronounced, and,

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at times, a burnt smell will issue therefrom. In case of the temperature being high, the same change occurs more quickly, and the colour of oil becomes darker, the oil itself tasting also less palatable.

Such being the case, Manchurian Bean Oil exported to the West is too often found seriously deteriorated by the time it reaches the United States or Europe via the Tropics. Then, in point of quality, too, there is no uniformity.

The popular standards of judging Bean Oil on the Western markets are (1) the quantity of free fatty acid contained; (2) the quantity of moisture and impurity contained; (3) the colour; and (4) the presence or absence of adulterating oil.

Manchurian Bean Oil, it is said, is not classed very high in the general estimation of the Western markets.

Matters standing as they do at present, chances of Manchurian Bean Oil for a successful competition with the rival oils on the Western markets are not at all reassuring. Then, as an article of commodity, it is not situated favourably. The improvement of the quality of Bean Oil by refining, together with the unification of quality are of the most urgent necessity for the raising of both reputation and demand of Manchurian Bean Oil.

The pending question at Dairen to inaugurate the Mixed Storage of Bean Oil at the hands of the South Manchuria Railway Company, like Beans and Bean Cake, is believed to be solved only after the method of refining has been introduced on the plane of commercial and technical workability.

The above refers only to the existing trade conditions under which Bean Oil is exported to the West as food and industrial material.

When thought is taken of the outstanding problem of organizing bean industry on a more scientific and approved footing in Manchuria or in Japan, the refining of Bean Oil must be pushed to the forefront for solution as a practical issue of vital importance.

To put it more plainly, the application of scientific knowledge to the refining of oil has hitherto been very limited. The recent wonderful advance in the chemical line of colloid and catalyzer has shed a bright gleam of hope upon the future of oil refining, and the chemists have filed on record various inventions of high value. In the future, the application of the same knowledge is expected to be of imperious necessity.

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Bean Oil has its own peculiar properties and status, and there are points about it that call for special study.

The scientific researches conducted by the Japanese in this direction are only a few, and their results have appeared in p. 761, No. 11, the Journal of Industrial Chemistry, 1908 (Mr. Y. Nishiyama, the author), p. 233, No. 1, the Report of the Central Laboratory of the Kwantung Government-General, (Mr. G. Uyehata, the author), etc.

a) Clarification of Bean Oil by Precipitation.

As abovementioned, the clarification of Bean Oil by precipitation is the common method applied to crude oil in general. In Manchuria, this process is very simple, it consisting in leaving still crude Bean Oil in a storage tank for a few days to wait for what impurities there are to settle, and in taking off the clear part. In some cases, steam pipes are led into the oil for accelerating the precipitation. At all events, it is found difficult to remove the impurities satisfactorily, and with the lapse of time, a foul precipitate will be seen to settle. Especially, if a high temperature has been applied for long, an increase in the free fatty acid in crude oil will be noticed. Therefore, in order to eliminate the impurity better under the prevailing circumstances, the impurity should be made to settle first, and then the oil should be filtered by means of a filter press of excellent make. Or else, a centrifugal separator may be brought into play.

However, in any of the above cases, anything like the perfect elimination of the free fatty acid is not to be hoped for. For the albumen and other organic impurities will remain in the oil in the form of a mucilagenous substance or commonly colloid, or otherwise in the form of fine grains. In either case, it will be certain to gain satisfactory results, if the coagulation or elimination of what may remain in the oil be sought in the line of colloid chemistry. Some fundamental solution of this interesting question seems to lie within scientific reach.

b) Bleaching of Bean Oil.

1. Bleaching by Clay.

It is necessary to destroy or remove the colouring matter without damaging the quality of Bean Oil. Dealers in edible oils have popularly used the clay

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method for the bleaching of vegetable oils. There are several kinds of bleaching clay in the West, but in Japan, Kambara clay (put out about Kambara in Yechigo Province or Niigata Prefecture) is regarded as the finest. Both Mr. Y. Nishiyama and Mr. Uyehata have experimented on Bean Oil by means of Kambara clay. The results of their investigations do not coincide in all details. The absorption of the colour of Bean Oil into Kambara clay is found to be more discouraging than in the case of other vegetable oils. This subject merits further investigation.

2. Bleaching by Carbon.

The use of carbon as a colour absorbent to oil deserves due notice. There has yet been nothing written on its application to Bean Oil. The decolouring action of carbon is subject to such variation that for each kind of oil, some particular kind of carbon is required. Ordinary oil has more than one colouring matter in many cases, so it is believed necessary to use one particular kind or more of carbon in treating Bean Oil. It is possible that a mixture of bleaching clay and carbon may serve the purpose better than generally conceded for.

Chinese Inn for Carts.

However, as regards the use of bleaching clay or carbon, as above mentioned, it refers to use under varying temperatures and in different lengths of time, and in different quantities, which process will enable one to ascertain the extent of decolourization and the loss of oil from the absorption of colour. The above is not based on any scientific foundation as regards the theory of bleaching by means of these absorbents.

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For this reason, further real development in the above direction will be made only possible by organizing the future study of the subject on an approvedly scientific footing.

Bleaching by Sun's Rays.

The colour of all kinds of fat in general is rather unstable to the sun's rays. This property may be turned to account, and oil may be exposed to the direct playing of the sun's rays so as to destroy the colour and decolour it. This method is often applied to yellow cocoanut oil and several kinds of wax. At one time, in the United States, too, it was used for bleaching castor oil. It admits of application to Bean Oil, too, with the result that decolouring is effected to some extent, although such application on any industrially workable lines appears impossible, because the oil layer must be necessarily very shallow, and besides altogether too long a duration of time is required. Moreover, as in the cases of other oils, the increase in acid value forms a serious drawback.

Recently, the high efficacy of utra violet light for bleaching purposes has been discovered, and it is further said that the same is being applied on an extensive scale to linseed oil with favourable results. The same has not yet been used for Bean Oil, to the best of our knowledge, but a study there of is believed to be pregnant with an interesting development.

Bleaching by Heat.

As the colour of Bean Oil is unstable to the sun's rays, so is it to heat and the oxdizing action of atmosphere. Therefore Bean Oil may be bleached by blowing air thereinto in order to accelerate the oxidation of the colour or by heating it up to a suitable temperature.

By effecting the above treatment in a proper manner, the decolouring process may be accomplished comparatively well, with scant possibility of the oil reverting to the original colour. Still, there is the risk of some chemical change overtaking the oil, often detracting something from the value of the oil as an edible.

It may be added that the above method has been applied to much advantage in the West in order to obtain linseed oil of light colour for use as paint-making material.

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Bleaching by Chemicals.

In Europe and America, sodium chromate and sulphuric acid are applied to both industrial and edible oils to oxidize the colour as in the case of its being heated and to bleach it, and good result is obtained. This will add still another matter for study regarding Bean Oil. There seems to be strong likelihood also to gain ample reward from the prosecution of the study involving the use of chemicals.

For instance, it has been demonstrated of late that boracic acid causes the colouring matter of linseed oil to get congealed, and also that carbonate does not facilitate the saponification of glycerloid like caustic alkali. However, none of the above mentioned processes has been availed of in industrial circles. They may be further studied with special reference to Bean Oil.

c) Refining by Alkali.

In the refining of crude oil, the neutralization of free acid and the elimination of colouring matter are of primary necessity. Alkaline solution has hitherto been used for the accomplishment of the two above objects. A solution of caustic soda is regarded as the most suitable, and gives a fair showing also with Bean Oil.

The study on the subject involves the relation to temperature, the strength of alkaline solution, the excess alkali at the neutralization of the free acid, etc. As the most important features, the neutralization of free acid without saponifying the neutral fat may be counted, like the destruction or elimination of the colouring matter without deteriorating the quality of crude oil. These factors have hitherto been studied separately at the factories and refineries. However, further investigations are wanted in order to obtain a systematic notion of physical and chemical principles under all these operations above mentioned.

Speaking of Bean Oil, it appears to lie within reach to realize suitable results as regards the elimination of the free acid, but as to the decolouring process, some of these methods leave much to be desired. In truth, part of the colouring matter floats in the oil in the form of colloid, and therefore, colloidal chemistry is thought to play a fair part in the solution of these problems.

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d) Deodorizing.

Deodorizing must be effected as the final operation in the manufacture of edible oil out of Bean Oil, which has a peculiar disagreeable smell of its own. It is not yet ascertainable what originates this smell, whether it exists singly or in a group of constituents, whether it is present in the oil in the same forms as in nature, and whether such smell is an attribute to several kinds of oil in common. Still, this much only is generally known. When Bean Oil has steam blown in that has been superheated in vacuum, most of the free acid and such matters as give aldehyde reaction will be removed, and what oil has been left becomes almost tasteless and odourless.

War Museum, Port Arthur.

If, by the above mentioned process, the offensive smell will not return even after the lapse of time, it ought to be accepted as satisfactory. However, oil thus treated with steam is often liable to change, not at all less susceptible to get spoiled than oil not so treated.

It behoves us to ascertain the identity of what causes the smell and to think out some practical improvement on what now obtains.

C) Manufacture of Derivatives.

a. Bean Oil for Paint Manufacture.

In view of the comparatively dear price of linseed oil as paint-making material, some cheaper substitute has been eagerly looked for. In consequence much interest has been awakened in semi-drying oil and driers, in the use of

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which a remarkable advance has been achieved during these ten years, and as to the chemical changes occurring while the oil is being dried, several valuable investigations have been conducted on scientific lines.

Bean Oil, in its very nature, is a semi-drying oil, and with the progress of the operations for the imparting of drying property, as hinted above, its availability for the manufacture of paint has been discovered, and this property is being exploited in the paint making circles in Europe and the United States.

However, it is still impossible to use Bean Oil as a full substitute for linseed oil. The one can be employed only as partial substitute.

The studies concerning making boiled oil of Bean Oil have already been published by Mr. Gardner, Mr. M. Tsujimoto (p. 226, No. 7, Journal of Industrial Chemistry, 1904), and Mr. S. Nishiyama (p. 765, No. 11, Journal of Industrial Chemistry, 1909). But there is plenty of room left for further study, especially with respect to the temperature to be applied to the mixture of Bean Oil and driers, the effect on the quality of oil of the temperature, heating, and air blown in. Moreover, there are several kinds of metals like vanadium, titanium, etc., besides such driers as cobalt, manganese, lead, etc., that have hitherto been used.

b. Making of Water Proof from Bean Oil.

The strong resisting quality of aluminium soap against water is well known. But, it is attended with difficulty to emulsionize it by adding water when it is to be used for a practical purpose such as in the manufacture of paints and water proofs. Heretofore, it has been dissolved by mixing therewith phenol or other organic solvent, and then alkaline soap has been applied, together with some water so as to put out something like an emulsion. However, this product possesses an offensive odour characteristic of an organic solvent, and is further highly uneconomical.

Mr. T. Suzuki (now on the staff of the Anshan Iron & Steel Works), while connected with the S. M. R. Co. Central Laboratory, Dairen, cognizant of the promising nature of utilizing Bean Oil in this direction, succeeded in inventing a water proof on both rational and economical lines from Bean Oil by utilizing aluminium soap, and has named it "Tantalus." This invention has been duly

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patented, and it is being manufactured at the Solite Manufacturing Co.'s plant. It is expected to grow in popularity.

Solite and tantalus, both invented by Mr. Suzuki, may be regarded as the herald of Bean industry in Manchuria, and his efforts ought to be properly appreciated.

c. Substitute of India Rubber from Bean Oil.

As in the case of vulcanization by adding sulphur to crude India rubber, there is a substitute for India rubber produced from oil by making it absorb sulphur. This article is known by the name of "faktis," the manufacture of which has been taken up in France for the first time on industrial lines.

For the manufacture of faktis, animal oil is ill-suited. The best available kinds are rape seed oil, linseed oil, and castor oil. Inferring from the suitability of such oils, it is necessary for faktis to contain up to a certain measure unsaturated fatty acids like oleic acid, linoleic acid, ricinoleic acid, etc. This circumstance encourages us to think that Bean Oil, too, from the consideration of its constituents, may be available for a like purpose.

In Germany, Mr. Grosse and Mr. Sauer succeeded in the manufacture of a substitute for India rubber, allied to the above mentioned, by subjecting Bean Oil to various chemical operations about 1910, and secured a German patent therefor. (No. 228 887 of German Patents and No. 430 183 of French Patents).

In Japan, Mr. S. Nishiyama has also interested himself in the study of the subject, but according to his report, the results have been hardly satisfactory.

d. Substitute for Hardened Oil, Lard, and Butter.

Attempts have been made from comparatively early times to obtain high-priced solid oil from cheaper priced vegetable or fish oil. But the elaboration of like enterprises into industrially workable undertakings date back only some twenty odd years. Investigations have been made about various catalyzers, and the greatest efficacy of nickel powder in the hydrogenation of fat has been discovered, thereby the foundation of the hydrogenation of fat having been firmly laid.

A wonderful advance has been made in this direction since, and it has been pushed to the forefront of the industrial world.

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In Europe and America, cotton seed oil is in the greatest request in this direction.

The hydrogenation of Bean Oil was studied as a speciality by Mr. T. Okada, then in the service of the S. M. R. Co. Central Laboratory, and its industrial feasibility was established, leading to the establishment of the Dairen Oil and Fat Industry Co.

Ruins of Antzushan Fort, Port Arthur.

Again, the results of scientific investigations concerning the hydrogenation of Bean Oil and solvents have been published by Mr. S. Uyeno (p. 932, No. 32, 1920, p. 899, No. 21, 1918, and p. 552, No. 18, 1915, of the Journal of Industrial Chemistry).

As to the hydrogenation of Bean Oil in Europe and the United States, every factory guards its own industrial secrets, access to which is almost effectually barred.

The hydrogenation of oil occupies the most important place among the ways of utilizing liquid oils. Especially, it has a very wide field of utilization, for instance, in making substitutes for lard and butter.

In the United States, half the total amount of all the vegetable oils produced in that country is being used as substitute for lard. Therefore, the lowering of cost of the substitutes for lard is a matter of great importance, and it is for this reason that this same theme has taxed an almost exhaustive study by the specialists interested. Most of the varieties of substitute lard now on the market may not be quite superior to hog lard, but may be regarded as quite as good.

The drawbacks common among the different kinds of substitute lard are that firstly they generally get divided into a crystal and a mixture consisting of olein

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mash of more or less liquid form, whilst no such phenomena are observed with hog lard in household use.

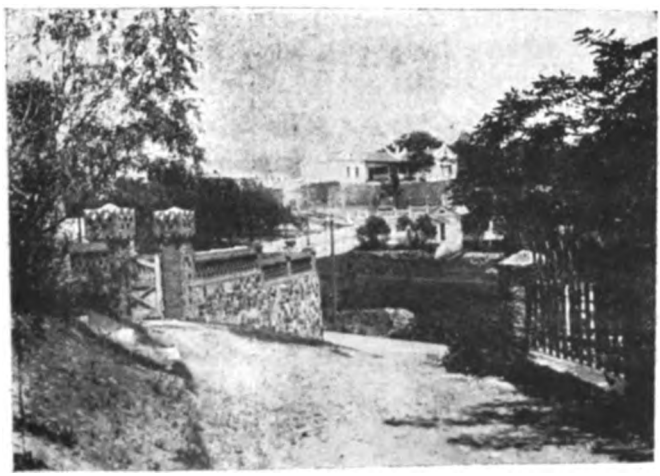
The removal of such drawbacks seems to call for technical study.

In the United States and Europe, hardened oil made from Bean Oil and other liquid oil is used in no less quantity for the manufacture of margarine (a substitute for butter) than for making substitute lard.

There are more items requiring study in the manufacture of margarine than in connection with that of substitute lard, for, in the latter case, flavour, physical consistency, etc., form more important assets.

Speaking of margarine, any that consists of vegetable oil only has not sufficient resistant power against the weather. So it is essential to adapt it to the climate of the market on which it is to be put.

Ordinary butter, compared with margarine, is possessed of a wider melting range. To be more practical, butter, even the moment it has been taken out of the ice chest, may be readily pressed and flattened, whilst, on the other hand, it is slow to melt even in a hot kitchen. With margarine, it readily melts in summer, assuming the form of soup fat, whilst it will be found very hard to cut on being taken out of the refrigeratory. These points may be studied scientifically with an eye to an improvement in the method of manufacture. Seen from a standpoint of biological chemistry, much room is still left for the improvement of oleomargarine in respect of flavour. Another point demanding study is how to prevent it from getting spoiled comparatively quickly, unless some antiseptic is applied.



Foreign-built villas at Ogoudai Summer Resort (Port Arthur).

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e. Manufacture of Liquid Fuel from Bean Oil.

Mr. M. Sato (on the staff of the S. M. R. Co. Central Laboratory, Dairen) has succeeded in manufacturing artificial petroleum from Bean Oil (p. 36, No. 18, 1922, "Light of Manchuria.")

This invention has not yet attained the stage of industrial workability. Still, he has opened another new mode of utility of Bean Oil, and his exploit deserves special notice.

B). Chemical Industry Utilizing Legumin.

Industrial Uses of Bean Cake.

That Bean Cake is indispensable as a fertilizer and cattle-feed in the Orient needs no reiteration.

We shall now proceed to enlarge upon the chemical industries in which the legumin in Beans and Bean Cake is made use of.

Legumin, apart from its use as a foodstuff and cattle-feed, has so far undergone only an inceptive study as to its industrial utilities.

Even in Europe and America, it is only a matter of recent date that the study of the above mentioned utilities has been taken up.

In the general manufacturing circles, legumin was looked upon in the light of waste matter not good for anything else than manure or cattlefeed. For instance, the legumin produced as a by-product in immense quantity from Indian corn in the United States, in connection with the manufacture of starch and alcohol, has been appropriated as only cattle-feed. It was owing to the neglect of study of legumin.

Especially, as to legumin of Beans, the only thing on record, at least to our knowledge, is that Dr. Osborne, of the Government Agricultural Experimental Station, has differentiated four kinds of legumin of Beans. In Europe, since the import of Manchurian Beans in 1908, the utility thereof has formed a focus of wide attention. Bean Oil has been used for making soap and hardened oil and also as a substitute for castor oil for paint-making.

In Germany, how to make artificial India rubber has been invented.

As regards the utilization of legumin of Beans, ways of its industrial application have been worked out in Great Britain, the United States, France, Germany, etc.

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In Manchuria, the study of this particularly interesting subject has made only half-hearted headway.

The only results so far achieved are the manufacture of a water paint christened "solite" by its inventor, Mr. T. Suzuki, of the South Manchuria Railway Company, who has secured therefor Patent No. 24595. The Solite Manufacturing Co., at Dairen, has been founded on the merit of this patented invention.

Solite is a water paint made from a compound of legumin of Beans and lime. This theme leaves not a little to be studied further, and this makes it all the more promising.

Manufacture of Plastic Substance from Legumin.

The formation of an infusible substance from a chemical composition of albumen and formaline was invented by Mr. Trikat in 1892. The same topic has been taken up by other specialists, and it has been established that formaldehyde, by chemically combining with the amide base of legumin, produces methylene legumin. This discovery resulted from a study from a medico-chemical point of view. In 1899, in Germany and Austria, Mr. Adolph Spitteler applied this scientific knowledge to industrial use in hardening the albumen of milk by means of formaline, and succeeded in producing a horny substance resembling celluloid. This new product has been named Karalit. Its manufacturing process was patented in 1899 (G. P. 115681, July 15, 1899; 14309, 141, 304, March 5, 1902; 147994, Feb. 19, 1901).

Supplementary patents were taken out subsequently in 1901 and 1902.

With these patents as the basis of industry, the albumen of milk put out as a bye-product in the manufacture of butter at a Vienna dairy was used as material for making plastic substance. The product has found its way also into Japan from a dozen years or so ago, although in a very small quantity.

Although what is going on in Germany and Austria cannot be ascertained, in Great Britain, France, and the United States, plastic substances are being manufactured on an extensive scale from albumen of milk.

As to the methods of manufacture, each country is vieing with one another in hitting upon a new and more commendable process.

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Australia gives the most liberal quantity of raw material in carrying on this industry, and both Great Britain and France each seems to be drawing a supply therefrom.

As already stated, formaline chemically acts upon not only albumen of milk, but all other kinds of albumen as well. It may be inferred that it may act almost alike on the legumin of Beans. A practical application of this inference was made for the first time by a Japanese specialist, Dr. G. Kita. As early as 1910, he dehydrated a piece of *tofu* (bean curd made from Beans boiled, ground, and steamed, which is a very popular and palatable food in the Orient) and had formaline to act thereupon. A horny substance of dark greyish and brownish colour was obtained. He conducted various experiments in hopes of obtaining a product of transparent and pale yellowish colour, but failed to reap satisfactory results. At length, he dissolved the legumin of Beans in carbonic acid, and then had formaline to act thereon in the existence of a catalyzer such as ammonia, and his efforts were rewarded with obtaining a transparent substitute for amber.

General View of Ogoodai Villas.
Grand Memorial Tower on Monument Hill in the distance

Next, in June, 1914, in Great Britain, Mr. Robert Dodd, obtaining a hint from *Koya dofu* (bean curd, frozen and dried) in the Orient, succeeded in the manufacture of plastic substances from legumin and took out a patent. (U. S. P., 1143893, July 22, 1915).

His process, according to the patent specifications, may be outlined as follow:—

In the Orient, "Koya dofu" is a popular article of food, which is a dried mass of Bean legumin. It is too brittle to be used. But the inventor has succeeded

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in manufacturing a hard and lustrous product according to the undermentioned method :—

After Beans have been freed from fatty substances, they are ground into powder and are then treated with water. A milky liquid will thus be obtained. This may be heated by mixing therewith bittern, magnesite sulphate, or formaline, or sometimes alumina sulphate or hydrochloric acid, so as to cause the legumin to get congealed. In case of the colouring of the product being desired, the colouring matter may be applied to the extracted liquor of legumin.

To be more particular, one kilogramme of Bean Cake is exuded in water, so as to separate the protein from the insoluble constituents. The filtrate is heated at 50° C. and 25 grammes of Columbia black are applied, together with 1.3 grammes of soap dissolved in 100 c.c. of tepid water. 100 grammes of alumina sulphate and 20 grammes of formaline are added to make it congealed. Then, the congealed mass is separated from water, and is put in a given mould to be pressed into a desired shape. It is finally soaked in formaline and dried.

In December, 1913, in France, M. Constin and M. Pirou invented an imitation of celluloid from legumin and secured a French patent (F. P. 41,9007).

The details of his process are as follow :—

Beans are first ground into powder and treated with hot water. Then a milky solution of 1,060 in specific graivty is had, and in order to make the extracted liquid congeal, such acids as acetic acid, phosphoric acid, nitric acid, etc., are applied. Or else alumina sulphate or alum may be used. Then the mixture may be boiled from two to eight days. Next, the congealed legumin may be separated, and pyridine, acetic acid, or resorcin, may be applied. Further, acetyl cellulose or nitro cellulose may be added. Then, magnesia, talc, kaolin, or like minerals may be mixed, so as to knead it well together. It is then either lengthened into something like filament, or flattened into a filmlike article. Lastly, it is soaked in formaline to make it hard and is to be subjected to a process like that generally followed in the manufacture of celluloid.

The chief feature of M. Constin's patent appears to be in mixing Bean legumin with nitric cellulose or acetic acid cellulose so as to turn out an imitation of celluloid, judging by his choosing filament or film for the object of his process.

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Dr. S. Sato took up the study of legumin in September, 1914, and secured the first patent ever granted in Japan in this particular line of research in March, 1915. The famous satolite is the child of his invention.

The theme of utilizing legumin has not yet been studied in any sense deeply. In order to go about it, the chemical properties of legumin must be fundamentally studied, and, once such properties have been ascertained, how to utilize them may be studied, or experiments may be conducted to test their industrial feasibility.

Dr. Sato prosecuted his researches on some such lines as above stated. At the same time, he carried on elaborate scientific investigations in the laboratory, whilst he pushed forward his laboratory experiments on industrial lines, and finally won the highly prized success (October number, 1919, and April number, 1920, Journal of Industrial Chemistry).

His achievement deserves a general appreciation.

III. Beans as Food Stuff.

The Japanese people have hitherto lived chiefly on rice, barley, and wheat, and from a religious tradition, which has disapproved of taking animal food, used to adhere to a vegetable diet.

Under such circumstances, little meat used to be taken as a source of protein supply. Fish has been drawn upon in part, but for most part, vegetable foods have been depended upon. Beans constituted the principal source of supply of legumin. They have been made into "soy," as a seasoning of national popularity. Very often they are boiled or baked, or made into *miso* (what is generally known as Japanese bean soup made from steamed beans, salt, and *koji*, fermented rice,—an article of food indispensable to Japanese breakfast), *tofu* (bean curd above referred to), Bean powder, etc. In a word, Beans, in Japanese cuisine, have played a most important role and have contributed a great deal, indeed more than any other article of food, barring rice, towards sustaining the vigorous constitution of the Japanese race.

As the population has increased in Japan, the demand for Beans has also expanded, and the domestic products alone have long fallen short of meeting it,

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and a good quantity thereof has had to be imported into Japan from Chosen, Manchuria, etc., to make up for the deficit.

After the Russo-Japanese War, Manchurian Beans found their way into Europe and the United States and rose rapidly in popularity, as their superior points became recognized. Already Bean Oil has established itself as a world commodity on the Western markets both as food-stuff and for industrial use. Especially, as an article of food, Beans are having their utility in varied forms gradually enlarged. There is nothing notable in the fact that the Orientals favour Beans as excellent food and take of them freely. But, their use by the Westerners appears contrary to their tradition and owes its origin to their conviction from scientific analysis that Manchurian Beans are endowed with superb merits as food.

Government Museum, Port Arthur.

It is also a matter of importance to broaden the utility of Manchurian Beans as a food-stuff. However, in their traditional uses in the form of *soy*, *miso*, *tofu* (bean curd), etc., the relation of supply and demand may be considered as practically fixed with only such a margin of elasticity as the natural increase of population may create.

We must own that our efforts in this direction have been sadly meagre.

The following are a few of comparatively new utilities, to which Beans are put:—

a) Bean Milk (Artificial Milk).

Bean milk has come into use only recently. It may be subdivided into two kinds. The first is what is often known by the name of *tofu-no-su*, which has for

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its chief object the manufacture of *tofu* (bean curd). The second is to make bean milk (or artificial milk) to be used as a substitute for milk. Each is made from Beans, and both have much in common between them in respect of materials and the method of manufacture. Only in the making of Bean milk, scientific knowledge has been brought to play. In recent years, a milk famine has prevailed all over the world and the price has kept soaring. In the midst of such circumstances, Manchurian Beans were introduced to the Western Markets, and Bean milk has come to attract attention among the Europeans and Americans.

Bean milk, in its composition, bears a close resemblance to cow's milk, its nutritive value being a peer to cow's milk.

The constituents of Bean milk, compared with those of various kinds of animal milk, are, according to the Physical Chemistry by Mr. Arz, as follows:—

	Albumen	Fat	Carbohydrate	Ash
Bean milk	5.76	2.40	1.40	0.84
Mother's milk	1.25	2.50	6.00	0.25
Cow's milk	3.50	4.00	5.25	0.75
Goat's milk	4.00	4.50	4.00	0.50
Sheep's milk	5.75	7.25	5.50	1.00
Donkey's milk	2.50	1.50	6.25	0.50
Horse's milk	2.00	1.00	6.00	0.50
Dog's milk	7.50	8.00	3.00	1.00
Hog's milk	6.00	7.00	4.15	1.00

Note: Bean milk may be either thickened or thinned at will.

What was experimented upon in the above table appears to have been more or less thick.

At least, with regard to legumin and fat in Bean milk, their nutritive value may be held quite as high as that of cow's milk, only there are some drawbacks firstly in the smaller quantity of sugar and ash; secondly in having a somewhat disagreeable smell and a less palatable flavour; and thirdly in the gradual precipitation of solid particles, which tastes unpleasantly, when the milk is allowed to stand, being separated from the clear part above.

The first kind of Bean milk called *tofu-no-su* used to be taken in more or less quantity as a nutritive beverage in Japan, but the same drawbacks have stood in the way of popularizing itself.

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However, Bean milk has the conspicuous advantage of being far cheaper than cow's milk. Therefore, if these drawbacks should be minimized or, far better, totally eliminated, it will be the most desirable as a substitute for cow's milk.

In Europe and the United States, the idea of improving the quality of artificial milk by a rational application of science has long been conceived, and already this conception has assumed a tangible shape on industrial lines, although on only minor scales.

For reference sake, a few modes of ulitization in the West may be reviewed below :—

1) Artificial Milk.

(W. T. Melhuish, Brit. 9626, July 1, 1915.)

Artificial milk is made by the composition of the mineral constituents contained in Beans or peanuts, sugar, water, and cow's milk.

In order to make 300 lbs. of artificial milk, 200 lbs. of water at 88° are applied to an equivalent quantity of potassium phosphate, sodium phosphate, oxide of magnesia, or carbonic acid of magnesium.

The above is made alkaline. To this, sugar equal to two-thirds of the mixture in quantity is applied, maltose of syrup-like description being preferred and the suitable quantity being 4.5% of the final milky liquid. The sugar should be applied while the liquid is being stirred. Then, this mixture should be put in a solution of 40 lbs. of walnut powder, made free from the skin and boiled with diluted carbonic acid of sodium, in water of from 78° to 85° in temperature, and be stirred for from 20 to 30 minutes. Next, the fat and legumen are to be extracted and emulsionized. Then, it is filtered and pressed, having ¼oz. of butyric acid of 50% dropped thereinto. The product will then assume both flavour and appearance of cow's milk.

Next, 18¾ lbs. of Bean powder is heated in a steaming pan with the object of taking off its odour. This is to be added slowly to 100 lbs. of water mixed with alkali phosphate, when necessary, until the soluble albumen and fat will amount to at least 0.5% of the liquid, the temperature being kept at 90°.

The extracted liquid of walnut and Beans is put into a vacuum pan together with the remainder of sugar, 250 grammes of calcium phosphate, and 500 grammes

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of sodium phosphate, to be boiled for half an hour under the reduced pressure of from 26° to 29°. The liquid is to be filtered and then either condensed or diluted to 300 lbs. If necessary, the product may be alkalized by means of sodium carbonate, and lactic acid bacteria may be cultured, so as to acquire the desired acidity. Then it is to be sterilized at 60° or 70° for at least 20 minutes and to be cooled off and stirred, getting 0.05-0.11% of citric acid dropped therein to.

Inside Government Museum, Port Arthur.

Artificial milk thus formed may be condensed and dried and pulverized, or may be made into cream by adding cocoanut or other tasteless fat. If boiled for a long time in a vacuum pan, it may be made into table cream. The residue is good for cattle feed.

2) Artificial Milk from Beans.

(H. Gossel Holl, 2122, Sept. 3, 1917.)

Fine powder of Beans may be stirred together with water and alkali phosphate in a small quantity, and the mixture may be heated till it boils for a little while. Then after cooling, it is to be pressed. To this solution is added edible fat and salt or sodium sulphate.

3) An Instance in Japan.

(Patent No. 28,346).

White Beans are cracked by a roller or in a mortar, and soaked in tepid water. When they have absorbed water liberally, sodium peroxide is applied in a small quantity, and the mixture is left alone for a while. Then, it is carefully

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neutralized with diluted hydrochloric acid, and is stirred well, leaving still for a time again, so as to let the cracked Beans expand remarkably in size, and at the same time to eliminate the smell peculiar to raw Beans. Next, the roots of yam (dioscorea japonica), lily bulb, and roasted sesamum seed are mixed therewith in a suitable quantity, and are ground fine, with water, sugar, and other seasonings added thereto.

b) Bean Coffee and Bean Chocolate.

In recent years, demand for coffee and cocoa has risen sharply and the supply has run short. In Europe and the United States, substitutes therefor have been eagerly sought among various kinds of vegetable seeds, and these investigations have been attended with good results. Beans, too, have come to be utilized in the same direction.

To quote a few instances:

1) Bean Coffee (H. Bauer. Ger. 290, 304. April 26, 1913).

By this process, not only the alkaloid, which is the constituent imparting the peculiar disagreeable odour to Beans, may be removed, but the decomposition of the Bean fat., while the manufacture of Bean Coffee is in progress or it lies under storage, may be prevented.

Before roasting the Beans, they may be subjected to extraction in hot water containing 0.5% of hydrochloric acid for from six to eight hours. After the liquid has been removed, the Beans may be treated with hot water again, so as to get rid of what is left of the alkaloid and hydrochloric acid. The same treatment must be repeated with fresh hot water at least four times in the course of two hours. In order to prevent the decomposition of fat in Beans by roasting them, they should be treated with 25% of hot saccharine solution before being roasted. By this means, the solution may be made to pervade every fibre of the Beans. When this has been done, the solution may be removed, and the roasting operation may be proceeded with according to an ordinary process. Part of the saccharine that has entered into the Bean fibres will turn to saccharic amide as the result of the roasting, and, by combining with the lecitin in the Bean fibres, it changes into lecitic saccharate. This is because of its being a far more stable compound than free lecitin, especially legumin lecitin.

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2) Bean Chocolate (Brit., 5, 169 Mar., 1912 N. Bergey).

Beans are soaked in 2.5% of an alkaline solution like slaked lime to germinate. Then they are washed and roasted, while they still retain the moisture, and are made to burst. The fat may be pressed before the roasting. With the roasted Beans may be mixed oleomargarine or cacao butter of vegetable composition, or some such in a small quantity, and they are then ground. This is used for making a substitute for chocolate, together with vanilla sugar, etc.

Or else the Beans may be ground fine and may be used as a substitute for coffee after a second roasting with grape sugar, syrup, etc.

c) Food made from Bean Powder.

There are three kinds of Bean powder, viz., Bean flour, roasted Bean flour, and fat-free Bean flour.

Bean flour is made by simply drying and grinding Beans. It is used principally for making Bean milk or *tofu* (Bean curd). Roasted Bean flour is known among the Japanese as *kinaki*, which is extensively used in manufacture of confectionery, etc. Formerly, Bean flour was limited in their use practically to the manufacture of Bean milk, *tofu*, etc., but of late their utilization has come to be extended gradually to the making of confectionery, pastry, etc. However, Bean flour containing, as they do, fatty substances, this lays more than one impediment in the way of working thereon. Therefore, it will be better to use Bean flour, from which the fat has been freed.

Wuhan Kuan Temple, Chienshan (Thousand Hills).
Seen from a distance.

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Hitherto, Bean Cake has been chiefly used as manure, and in part as cattle-feed. Whether Bean Cake has been made by the general expression method or by the chemical extraction method, Bean Cake or Bean meal represents what has been left of the Beans after the fatty constituents have been removed. Therefore, the preparation of an article of food from the Bean Cake is rationally possible. Expecially, as the presence of fat in Beans often impedes the working process, the use of Bean Cake will be found all the more preferable, particularly in the manufacture of confectionery.

Bean Meal left by the chemical extraction method has a smaller percentage of fat than ordinary Bean Cake. So it is the most convenient to pulverize and to work on it.

In point of nutritive value, Bean Meal does not lag behind American made wheat flour, and what is more attractive, it is cheaper in price. Therefore, it will be very sensible to tap its furture demand.

Only, Beans have their own unwelcome smell, but, according to recent investigations, the removed of this smell is by no means impossible.

Thus, by the mixture of American flour, rice flour, sugar, etc., Bean Meal will make an excellent material for preparing sweets, bread, etc.

Its uses may be grouped as under:—

1) It may be mixed with wheat flour, eggs, butter, etc., to make biscuits and other confectionery therefrom.

2) It is available for preparing soup, together with cabbage, tomatoes, green beans, potatoes, turnips, carrots, fruit extracts, meat extracts, etc.

3) It may be used in making bread by mixing it with wheat flour, barley flour, rice flour, other carbohydrates, and objects containing mineral substances.

4) Availing of the presence of much albumen in Beans, Bean Meal may be subjected to varied processes to make roborants.

The study in the above lines has made remarkable headway in Europe and America, and a few kinds of manufactures are actually being turned out.

At Vienna, Austria, recently, Dr. Laszlo Berczeller has succeeded in putting out the finest article of food; earning high compliments for his scientific exploit.

In Japan, the study of the same subject has scarcely gone beyond the results attained by the S. M. R. Co. Central Laboratory some years ago.

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Hints on manufacture of food from nutritive point of view.

As above stated, Beans make valuable materials for making Bean milk, Bean flour, bread, etc., and in nutritive value, they hold their own with milk, wheat flour, etc., as has been demonstrated by the results of analyses.

What must be borne in mind is that the data obtained from a chemical treatment about the quantities of albumen calorific value, etc., are not always a dependable indicator of the intrinsic value of a food. For instance, that cow's milk and green vegetables play an important role in supplying nutriment should not be determined merely by the quantity of albumen and calorific value. There is no denying the presence of something else which gives important active results. The question whether vitamin, which now constitutes an essential factor of nutriment, exists in Beans or not should be solved first of all.

At the same time, a zest of the palate or relish is a thing that cannot be left out of consideration when it concerns articles of food.

For instance, such as *soy*, *miso*, *tofu* (bean curd), etc., are all excellent articles of food, but scarcely any of them can be forced on the Western palate. Tastes differ and do not permit of logical arguing.

From a chemical view point, Beans are an ideal article of food, containing 40% of albumen and 20% of fat, which is obtainable at a very cheap price.

We should pay due respect to the biological factors as above stated in the quest of new uses for Beans as the most rational and ideal food.

Conclusion.

What is now in the highest demand in Europe and the United States is not Beans themselves, but Bean Oil or various products made therefrom. During the first few years following the introduction of Manchurian Beans to Europe and the United States, they were exported as they were to serve as material for the manufacture of Bean Oil in the West.

However, with the development of Bean milling industry in Manchuria, the export of Bean Oil became more popular, whilst that of Beans fell off sharply. This phenomenon might be accepted as an evidence of a stride taken forward in bean milling industry.

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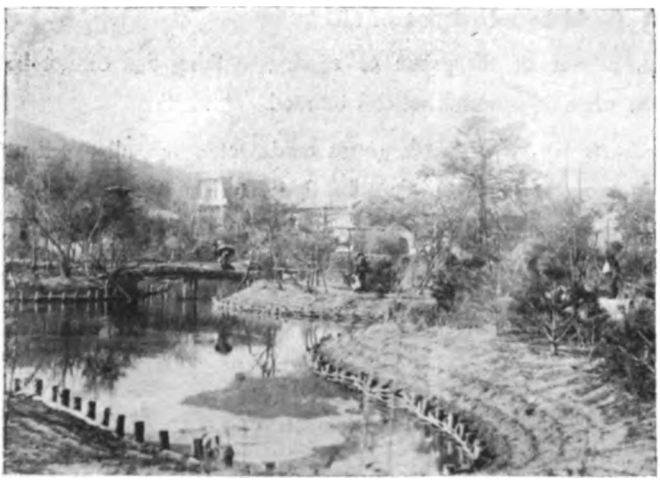
Still, Bean Oil from Manchuria was not quite satisfactory in quality, and on this account, it had to be refined first before being used. Therefore, the price quoted thereon was naturally low.

If some refining process should be organized by the Japanese mills in Manchuria and Bean Oil should be exported as refined Oil, the gain will not be confined to the financial aspect only, but also in the improvement and unification of Bean Oil, which will raise the reputation of Manchurian Bean Oil on the Western markets.

The present appears to be the stage in which the Bean Mills in Manchuria ought to be converted from manufacture of crude oil to that of refined oil. The larger profit accruing from the manufacture of refined oil will serve to lower the price of Bean Cake or Meal (which is the residue), and consequently to enlarge the market for the same. This will be hitting two birds with a stone.



Hot Spring Hotel, Wulungpei.

Time is highly ripe for such. And yet, the plans to found refineries is very slow in materializing.

This is mainly due to lack of scientific knowledge about the refining process, and also of capable specialists qualified to assume the role of guides.

The questions before us are whether or not it will be an idle dream to hope for the export of Bean Oil after its refining, and also whether or not the markets in the West exploited by Manchurian Beans and Bean Oil could be maintained and further developed, without any material improvement being ushered into the status quo.

Let us now turn to how other vegetable oils and fish oil stand at present.

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To take up cotton seed oil, first of all, cotton seed, which is the material, is produced in the largest quantity in the United States, being followed by India and Egypt, which mainly supply Great Britain.

It is true that there was a time when American cotton seed oil used to be exported to Great Britain in a considerable amount. But, now with the growth of oil milling industry in that country, the domestic consumption of cotton seed oil has increased to 79% of the total outputs, thereby cutting down considerably the export capacity. This has quite unhinged the supply relation in Great Britain. Although it is almost next to impossible to look for the increased production in the United States, India, and Egypt in the immediate future, yet in the Orient, China gives a good promise as a cotton producer, and may well be expected to supply an increasing amount of cotton seed. So, China will in due course of time develop into a leading supplier of cotton seed oil.

Linseed was put out chiefly in Germany, Russia, and Belgium in Northern Europe and also in the United States and Argentina, etc. But, the ravages of the Late War have told on the North European countries, and the world's market has been running short of stock. With the economic rehabilitation of these countries, the shortage now felt will be gradually made up.

China may be regarded as promising in a sense as supplier of linseed, which is produced in the north of Chihli and Shansi Provinces and the zone extending from Chahar to Mongolia. At present the total annual yield is scarcely over 500,000 piculs, but the prospective completion of the Peking-Suiyuan Railway, will bring about the general development of the Chahar and Suiyuan Districts and the consequent increase of the production in a large measure.

Rape seed is put out in Japan, India, and China. The Japanese product is pronounced as of superior quality, but is invariably rather higher-priced because of the comparatively stiff cost of production. Thus, it is at a slight disadvantage in competition.

The present China gives a considerable amount of outputs, and as the Yellow River Valley becomes opened up, it is bound to increase gradually.

Ground nuts are produced in China, Japan, the United States, the French possessions in Africa, India, etc. Peanut oil is of excellent quality and is fully available as a substitute for olive oil. Their demand therefor will easily keep pace

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with any increase of production. As it is, China is one of the heaviest suppliers with the prospect of increase with the development of Honan Province and the adjoining territory.

Paulownia oil is a drying oil serving as a paint material. China is the producing centre. The shortage of linseed oil will tend to raise quickly the output of paulownia oil in China.

Recently, the quantity of fish oil used as material for making hardened oil has been really remarkable. As it is produced in immense quantities, it must be fully reckoned with.

So much for Bean Oil.

The food famine prevalent all over the world has caused Beans to be included in the food list, and several means of working thereon in the same direction have been invented and popularized, evolving an opportunity for industries utilizing Bean albumen, as hinted above.

Kaoliang Harvested.

From the above, it is all too plain that Manchurian Beans have a very bright future before them indeed. But, it would seem rather out of place for Manchuria (the producing centre) to be neglecting the ways of utilizing them, and waiting to be taught by their Western consumers.

It behoves us in Manchuria to institute a scientific study in a positive manner of how to work on Beans, and to industrialize any useful knowledge that may reward our efforts, so that the producing centre may, at the same time, become the centre of Bean industry.

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Has this paramountly important subject of study been treated by the authorities in power as it ought to be?

As things are, the only chemical industrial laboratory in the whole of Manchuria is the South Manchuria Railway Company's Central Laboratory staffed with only from thirty to forty specialists.

It is true that the Central Laboratory has contributed untold good towards the advancement of chemical industry in Manchuria. However, the Bean industry, in its multitudinous phases, is too complex a topic to be tackled adequately by the Central Laboratory with its existing staff.

Either the Laboratory may be enlarged so that it may be entrusted exclusively with the comprehensive task, or else a new separate institution may be established specially for the purpose.

SALT INDUSTRY IN KWANTUNG LEASED TERRITORY.

By Mr. T. Kimura,
in the service of Oriental Development Co.

Salt permits of no substitute. It is indispensable to man in his daily life. We mean common salt (or sodium chloride). The sea-water in which salt is found dissolved is in itself an ideal liquid necessary for the existence of life. This point may be demonstrated scientifically. The sea is *umi* (海) in Japanese, which, by coincidence, sounds the same as production (産).

Salt is not only a substance, of which the human body stands in physical need, but also the primary seasoning.

In October, 1919, the Salt authorities in Japan asked the Extraordinary Financial and Economic Investigation Commission to report on the production, distribution, price, etc., of salt. At the first session of the Commission, the late Mr. T. Hara (the Prime Minister of State), in an impressive speech as the Chairman of the Commission, sounded a startling warning that, surrounded as Japan is with seas, she is badly short of salt. It was this very warning that has awakened echoes of interest all over the country and has imbued this subject with much greater importance than ever vested therein.

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I was instructed about that time to make a systematic investigation of the existing salt fields and also such as may be converted into such in Manchuria, Mongolia, Chosen, and Tsingtao. It may be added that my investigations have an eye to the incorporation of their results into some tangible enterprise, and such being the case, the places selected naturally tend to be confined to the more promising ones.

In the course of my enquiry, many interesting phenomena have been brought to my notice. To cite an instance, in Salt Lakes in Inner Mongolia, from one of many holes in the ground, white salt is being spouted forth to the amount of a few cubic feet per hour.

As regards the salt manufacturing industry by natural evaporation, for which unbounded possibilities are promised by the gently sloping beaches stretching along the sea coast from Fengtien Province southwestward in China, the existing Salt Administration system in China is anything but conducive to the actual development of the industry. It is regrettable that very little has been written on this theme in China for general information.

For the present purpose, the salt industry in the Kwantung Leased Territory will be dealt with principally.

Brief History of Chinese Salt System.

The laying out of salt fields by evaporation on the coasts of South Manchuria dates back only sixty years to the Tungchih Era of the Manchu Dynasty. In what is now the Kwantung Leased Territory, the first salt field was laid out three years later at Pitsuwo in the northeastern part of the Leased Territory. Of course, the enterprise was founded and maintained then under Chinese rule.

It may not be out of place to make a brief review of the Salt Institution of China which has its own traditions and peculiarly complex organization, not to speak of its strict regulations.

In China, the production of salt is traced to 2,700 A.D., in which Emperor Huang (Yellow) caused salt to be obtained from the sea water. About 2,200 A.D. in the reign of King Yu of Hsia (Summer), sea salt was made to be presented to the Court as tribute. About a hundred years later, the appointment of Salt Officers is on record. Still, the use of salt seems to have been limited to

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festive occasions, and it was not yet offered for sale for daily general consumption.

Kaoliang stacks just harvested.

It is a curious coincidence that salt figured prominently among offerings to gods and was prized high as a luxury also in the Occident as in ancient Egypt. As late as 700 A.D., Premier Kuan-chung of Chi turned much of his attention to the salt administration and even concluded that a country bordering on the sea could be made rich and strong by carrying out a good salt policy. It was then that the salt tax was introduced for the first time, and the same Statesman raised the status of his country over its neighbours. The proverbial "Croesus" of China built up his countless wealth on the proceeds of salt. In the Chin Dynasty, in which the Grand Wall of China was constructed, the profit accruing from salt business is said to have multiplied twenty times the old revenue.

In later years, penalties for offences against the Salt law became more torturous. Licenses for sale of salt were issued for the first time in Sung Dynasty. In Yuan Dynasty (founded by the Great Genghis Khan) regulations were issued for salt business. In Ming Dynasty (preceding the Manchu Dynasty) any one who dared to break the law or to forge the license was doomed to capital punishment. The same Law operated over any one who, without Government permission, manufactured, transported, and sold salt, or else, though provided with the necessary permission, failed to observe the regulations in every detail.

The Manchu (Ching) Dynasty followed what was in force in the Ming Dynasty. Only it enforced the control of illicit salt more rigorously. Just before the downfall of the Manchu reign, or in the first year of Hsuan-tung (1909), when

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the financial authority of China was concentrated at the Peking Government, the Salt Administration, too, was reorganized, and the Salt Administration Office was established at Peking, with the Minister of Finance additionally holding the chief place therein. In the Provinces, the Salt Offices were opened, the Viceroys or Governors of the Provinces serving as their chiefs ex-officio. However, the actual salt business was attended to by the Directors of the Salt Transportation Offices, who saw that the Salt gabelle was duly collected and salt was properly distributed. Such offices were established in Fengtien, Chihli, Shantung, Kiangsu, Chekiang, and Kuangtung.

For other salt producing Provinces such as Fukien, Shanhsi, Szechuan, Kansu, and Yunnan, and elsewhere, which are consumers, Salt *Taotai* were appointed.

On the advent of the Chinese Republic, when Mr. Hsiung-hsiling became Premier, the recorganization of the Salt Administration on a business basis was set about. By the new system, the Salt Administration Office was opened at Peking and presided over by the Minister of Finance. In the producing centres, the salt production offices were kept, and, in the transportation and consumption districts, salt purchase and transportation offices were established, and under which salt inspector's offices and private salt inspectors' offices were maintained.

As regards salt taxes, too, the Salt Gabelle Offices were established, in order to ensure a precise collection of the gabelle and the unification of the system.

In April, 1913 (the Second Year of the Chinese Republic), the treaty concerning the Postbellum Loan for the Chinese Government was concluded with the Pentagonal Syndicate involving Great Britain, France, Japan, Russia, and Germany, with the Salt Gabelle for security.

Prior to the above, a good number of foreign loans had been raised by China with the Salt Gabelle for part or whole of security, in addition to several indemnities, such as the Supplementary British and German loans, the Boxers' Indemnities, the Crispi Loan, the new Peking Hankow Railway Loan, the Hankow-Canton Railway Bond, etc.

As to the loans secured with the Salt Gabelle, the Pentagonal Syndicate (Germany being excluded as a natural sequel to the outbreak of the Great War, followed by the non-participation of Russia because of her internal dissolution), or

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more strictly speaking, the Loan Syndicate was invested with a preferential right, and the supervision of the Salt Administration rested with the same Syndicate.

In May, 1914 (the Third Year of the Chinese Republic), China promulgated the Salt Administration Office Act, engaging foreign advisers, and thereby practically revolutionizing the system.

Salt Administration, as it Stands.

The Salt Administration system of China, as it stands to-day, may be tabulated as under:—

Table I.

Ministry of Finance.

(President) Salt Administration Office.

Minister of Finance holding Presidency ex Officio.

(Associate Chief Inspector) Foreign Adviser to Salt Administration Office.

Divided into

1. (Secretary) General Office.
2. Chinese Secretary and Financial Secretary, Foreign, Salt Revenue Office.
3. (Director) Salt Production Office.
4. Director, Salt Transportation and Consumption Office.

The Salt Administration Office controls the whole of the Salt Administration of China and is presided over by the President, which post being held ex-officio by the Minister of Finance. Under the President, there is Chinese Secretary of the General Office supervising all Salt affairs of the country, excepting what lies under the jurisdiction of the Chief Inspector at the head of the Salt Revenue Office.

The General Office looks after the Salt Inspectors' Offices and also the Salt Gabelle Offices in all China.

The Salt Production Office supervises the salt fields, salt depots, salt manufacture, and policing of the salt fields, in addition to the control of privately-produced salt.

The Salt Transportation and Consumption Office directs the transportation, sale, and consumption of salt.

Both the Salt Inspectors' Offices and Salt Gabelle Offices are under the control of the Salt Administration Office, and between the two, the salt systems of the Provinces are supervised, inclusive of the salt fields, transportation, and

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consumption of Government salt and also privately-produced salt, and also the control of possible smuggling or illicit production.

Under the Salt Inspectors' Office, there are branches at producing centres, each being looked over by Superintendent. There are also salt gabelle inspectors and salt field inspectors.

Private Salt Offices are maintained at important points on the routes of salt transportation, and are directed by the Superintendent of the Salt Inspectors' Office.

Salt Depots have branch depots and attend to the transportation and sale of salt.

Salt Purchase Offices are kept at some salt centres to buy stocks when necessary.

Salt Revenue Office.

The Salt Revenue Office is a special institution maintained in terms of Article 5, the Postbellum Loan Agreement, as above stated. It is directed by Chinese Chief Inspector and Associate Chief Inspector, which latter office is held by the Foreign Adviser. The Chinese Chief Inspectorship is held concurrently by the Secretary of the General Office. The posts of the co Chief Inspectors, together with the Financial Secretary, are appointed by the Minister of Finance.

Chinese factory where baskets for Bean Oil are made at Antung.

To dwell on the functions of these establishments, the Salt Revenue Office looks after the collection of salt gabelle, its accounts, and also keeps track of all salt purchased, stored, and sold by the government. The reports presented by the

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Salt Revenue Office must be published after an overhaul by the Minister of Finance.

Both Chief Inspector and Associate Chief Inspector undertake the issue of transportation permits and the preparation of sundry salt revenue reports and the safeguarding of the interests of the various foreign loans secured with the Salt Gabelle.

Whenever the Chinese Government wishes to employ part of the Salt Revenue, the approval of both Chief Inspector and Assistant Chief Inspector is required, and in performing these duties, both are under the direct control of the Minister of Finance, but not under the Secretary of the General Office.

Salt Gabelle Branch Offices.

Salt Gabelle branch offices are controlled by the Salt Revenue Office and are kept at salt centres. Each branch office is looked over by a Chinese manager and assistant manager (foreign). It attends to the transportation of salt, issue of certificates and permits, assessment of salt gabelle and other auxiliary taxes and fees, supervision of the collection of salt gabelle elsewhere, surveillance of the performance of duties by officials of the Salt Production Offices, etc.

The functions are quite comprehensive involving heavy responsibility.

Adviser to Salt Administration Office.

As above stated, the post of Adviser to the Salt Administration Office was created by virtue of Postbellum Loan Agreement with the object of readjusting and improving the methods of collecting salt gabelle. This post is concurrently held by the Associate Chief Inspector (foreigner).

When the Associate Chief Inspector is absent from the place of his duties, the Financial Secretary (also foreigner) of the Salt Revenue Office acts for the Associate Chief Inspector.

The Adviser is consulted by the President of the Salt Administration Office previously, when any reorganization of the Salt system is considered, when any agreement is to be signed that affects the Salt Gabelle or the methods of transportation and sale of salt in the Provinces, or when the issue of any Government decrees or instructions regarding the same is contemplated. He is also charged to

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carry out the inspection of the salt affairs under the authorization of the Minister of Finance.

Matters to be consulted about with the Adviser by the General Office are roughly as under :—

1). How to transport salt in the Provinces and how to improve it.

2). Matters concerning salt gabelle and fees and other receipts from the same source ; salt accounts ; and defrayments out of the Salt receipts.

3). How to buy, store, transport, and sell Government salt and matters that interest the Government officials concerned and the Associate Chief Inspector, the Financial Secretary and others appointed in terms of the Postbellum Loan agreement.

The salt manufacturers in China may be divided into the following five classes :—

a) Those manufacturing ordinary table salt.
b) Those gathering brine or experimenting on its manufacture.
c) Those gathering rock salt and minerals containing salt.
d) Those manufacturing salt of different kinds and such substances as contain more than 40% of sodium chloride.
e) Those who manufacture refined salt.

Any one of those engaged in any of the above mentioned industry must be of Chinese nationality, and a special Government license is required for such industry. In order to take out a special license, an application may be addressed to the Superintendent of the Salt Transportation Office through the junior office. When the salt in question is examined and passed, a special certificate is issued.

The area for transportation and sale of salt is definitely demarkated by Government decrees because of the necessity of preventing the evasion of payment of the gabelle. No transportation beyond the demarkated area or without Government permission is allowed.

For instance, the sale area for salt produced in the Three Eastern Provinces comprises the Three Provinces of Fengtien, Kirin, and Heilungkiang, in addition to Jehol and Mongolia, while the sales are as under the jurisdiction of the Superintendent of the Salt Transportation Office of Kirin and Heilungkiang Provinces are limited to these two Provinces.

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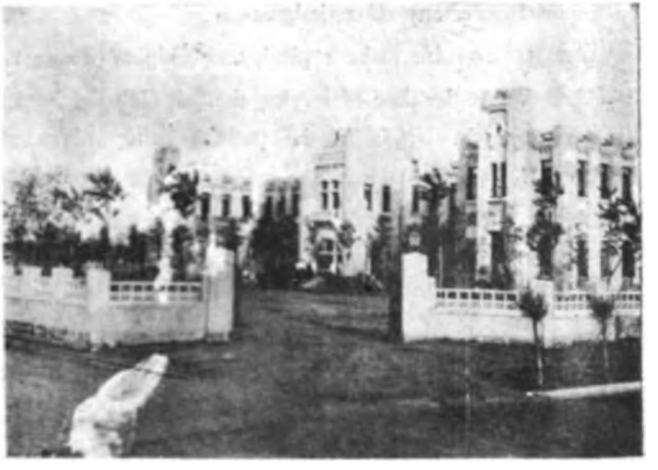
Any offence against any of the above mentioned Laws, regulations, etc., is penalized, and as regards privately-produced salt, it has a separate law by which it is governed.

Any breach of the Law concerning privately produced salt is liable to from police detention to an imprisonment for a given period. Any offender against the same law, who has had a party of confederates in committing the offence, and who has either killed or wounded another is liable to imprisonment for life or some less heavy penalty.



Yamato Hotel, Changchun.

When an official or a soldier in the Salt Service is found guilty of a breach of the Private Salt Law or of a complicity in such offence, a heavier penalty will be imposed upon him.

Any one who has profited by such offence will be sentenced to a fine.

In some cases, one found guilty of such offence will be deprived of his or her civil rights.

Salt Gabelle.

The Salt Gabelle Act of China may be translated in substance as follows:—

Art. 1. All salt produced and consumed in the Republic of China is amenable to the present Act, excepting Chinghai, Thibet, Mongolia, Hsinkiang, etc., which are regarded as special districts.

Art. 2. The sum of S.¥3 per 100 *kin* is imposed as gabelle, not including salt for industrial and fishery uses.

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The gabelle at the above rate operates also on salt to be imported from any of the Special Districts above mentioned.

Art. 3. The Salt Gabelle is collected at the place of production. For such as is imported from any of the Special Districts mentioned in Art. 1, the gabelle is collected at the time of import.

Art. 4. Salt Gabelle can be levied according to the present Act, but cannot be imposed under any other designation.

Art. 5. 100 *kin* make 1 picul, and 16 piculs make 1 English ton.

Art. 6. At the time of levying the Salt Gabelle, the nett weight of salt may be gone by (the weight of the packing being subtracted). (c. f. Presidential Mandate No. 5 dated March 2, 1918).

Art. 7. (the last article) is omitted.

Actual Salt Gabelle Returns.

During Recent Three Years.

Table II.

Under Salt Production Office	1916	1917	1918
At Changlu (Chihli)	S.Y12,486,895	S.Y11,230,719	S.Y14,277,515
In Manchuria	5,259,481	6,501,327	5,181,065
Shantung	2,611,856	3,073,227	2,855,951
Shanhsi	2,271,531	3,683 025	3,918,392
Part of Kiangsu & Anhui ...	6,851,859	5,168,620	5,928,103
Chekiang	3,221,429	3,498,713	3,807,344
Kuangtung	6,033,837	7,300,067	7,091,900
Fukien	1,450,859	2,182,498	955,976
Szechuan	3,532,825	8,171,191	8,774,747
Yunnan	2,070,157	3,698,563	2,532,100
Under Sub-Offices			
At Panpu	6,405,085	4,581,659	5,601,854
„ Sungkiang...	1,207,044	1 825,000	2,226,525
„ Kuangchichiao (Kuangtung	823,809	1,170,896	891,100
„ Hsichpeng (Szechuan) ...	1,880,369	1,822,630	1,619,805
Under Salt Transportation Office			
Hupei	3,250,819	2,920,933	4,096,505
Hunan	5,108,204	5,902,020	1,055,312
Kianghsi...	2,811,197	2 480,701	2,929,297
Anhui	2,007,012	2,162,534	2,231,445
At Ichang	2,430,142	2,502,577	1,825 221

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Transportation & Commutation	1916	1917	1918
Office at Shashih	117,918	118,707	66,662
Office for Mongolia	548,233	490,222	670,519
Under Salt Transportation Office			
Shanhai	284,200	315,264	280,833
Kuanghai	1,080,503	1,231,257	1,308,145
Hsuing (Kansu)	841,848	306,277	70,959
Total	80,450,007	82,704,687	80,287,366
Aggregate National Revenue ...	472,838,584	Unascertainable	Unascertainable

Outputs.

As seen above, the Salt Gabelle in China forms the chief item of the national revenue always exceeding in amount even the Land Tax and the Customs Revenue.

Table III.

The following is a table giving the salt outputs in the districts under the jurisdiction of the different Salt Offices in 1916 :—

	Outputs.
Changlu	2,917,490
Three Eastern Provinces	3,367,771
Shantung	1,066,801
Shanhsi	1,421,934
Part of Kiangsu and Anhui	5,831,909
Chekiang	2,832,203
Szechuan	6,652,491
Total	25,044,598
	or 2,504,460,800 *kin*

In addition, there are other producing centres such as Fukien, Yunnan, etc. We shall refrain from entering into the conditions prevailing in the producing centres.

Next, as to the salt system in Manchuria, Mongolia, etc., in Fengtien Province, in which both production and sale used to be left absolutely free, the license system was introduced in the 18th year of Kanghi (1679) under direct management of Fengtien Province, and later in the 8th year of Kuanghsu (1882), the levying of 4,800 cash per *k.kw* of salt was given effect. In the 17th year of Kuanghsu (1678), the Salt Gabelle was included in the Central Government revenue.

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Production and Consumption.

The relation between production and consumption in China may be judged from the following:—

Table IV.

	1914	1915	1916
Three Eastern Provinces	picul	picul	picul
Production	6,017,415	1,795,793	3,367,771
Consumption	3,697,747	2,482,359	2,526,781
China			
Production	37,007,997	20,198,764	25,044,668
Consumption	24,639,172	28,864,065	32,887,780

As to Three Eastern Provinces in the above table, they refer only to the outputs of the two Provinces of Fengtien and Heilungkiang, those of Fengtien Province taking up about 90%, and the figure for Kirin Province was not included.

The salt fields along the coasts of Fengtien Province, according to the reports so far available, appear to have been operated much on the lines of the salt fields in the Kwantung Leased Territory, which are worked by natural evaporation. However, the shapes of these fields being of varied descriptions, it seems difficult to fix upon the standard unit of area.

The area of the salt fields totalled 3 *fu* of Government fields, 584 *fu* belonging to the Ministry of the Interior, and 3,754 *fu* of privately owned fields, the aggregate average annual outputs being put at 350,000,000 *kin*. If the salt fields outside the Leased Territory should have about the same producing capacity as those therein, something like 18,000,000 *tsubo* in area will be required to put out the above mentioned annual total. Upon this hypothesis, 1 *fu* may be put at about 4,500 *tsubo*.

The chief producing centres outside the Leased Territory are Yingkou, Kaiping, Fuchou, Chuangho, Antung, Fenghuancheng, Panshan, Peichen, Hsingcheng, Chinchow, etc.

The salt of Heilungkiang Province is produced on the banks of salt ponds and lakes, and is utterly different from sea-salt in the condition of production.

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There are in Heilungkiang Province two salt lakes named Chorhpote and Payenchahan. The former is about 5 miles in circumference. It is situated in the centre of a district fashioned like a basin, and is like a kettle in shape. The bed of the basin consists of black clay. After the rainy season in spring and summer, a space of over 2½ miles from east to west and 1.7 miles from north to south is said to be covered with white salt, presenting a splendid spectacle.

The height of the salt gathering season falls in June. The upper crust is of course snow white, but in the lower layers, the salt is affected by the colour of the clay and looks like crude salt made by natural evaporation.

As to the output, no recent data are yet available.

In the 34th year of Kwanglsu (that is, 1907), the total production was put down at 810,000 *kin*; that for the next year at 110,000 *kin*; and that for the succeeding year, 1909, at 850,000 *kin*.

The output of the other lake (Payenchahan) is smaller in quantity and inferior in quality, too.

In the same Province (Heilungkiang) there is a salt ground, which is interesting to visitors, on the Prefectural boundary of Anta. Its output may be calculated by hundreds of thousands of *kin*. At certain points, earth is gathered by sweeping, and this is mixed with water of the salt lake and is stirred. After being left still, the upper clear part of the liquid is made mother liquid and is boiled. The novelty of the process commends itself to one's notice.

In the Three Eastern Provinces, because of the abundance of sea salt in Fengtien Province, surplus production was noted, as may be seen from Table IV given above, to the extent of roughly 250,000,000 *kin*.

In the same period, the total average consumption of salt was 290,220,000 *kin*, being some 10% less than the average total of 328,190,000 *kin* for about 10 years before, that is, for five years about the 2nd year of Hsuantung (1910). It may be added that a difference of such magnitude may easily creep into the calculation, if the principles of gathering the data should differ.

However, the aggregate annual demand for table salt in the Three Eastern Provinces might be placed at 300,000,000 *kin* with an approximate correctness. This total might be distributed to the three Provinces at the rate of 220,000,000 *kin* for Fengtien Province (inclusive of Jehol District), 55,000,000 *kin* for Kirin

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Province, (being one quarter of the share of Fengtien), and 25,000,000 *kin* for Heilungkiang Province.

Next, as to price, it has been found, on the whole, stiff.

On the South Manchurian coasts, salt manufactured by natural evaporation is estimated to cost ¥1.50 per *koku*. Salt for delivery at the salt field may be quoted at 25 sen silver per 100 *kin*, to which may be added S.¥2 in large dollars or S.Y2.50 in Chinese small silver coins for gabelle, not to mention costs of transportation, etc. Therefore, salt will cost at least S.Y2.75 or so per 100 *kin*.

Speaking of the lake salt in the north, even the output of the great salt lake in Inner Mongolia, will come up as high as G.Y3 or Y4 per 100 *kin*, when it reaches the place of consumption. At Kailu, for instance, in Inner Mongolia, the highest qutation is Y7 per 100 *kin*.

As to the sale of salt, in Fengtien Province, the dealers in salt may be divided into wholesale and retail dealers.

The necessary qualifications for the wholesale dealer are (1) that he is a Chinese citizen never convicted of an offence against the Private Salt Law, (2) that the place of business shall not be near a salt depot or inside the South Manchuria Railway Area or an area akin thereto, and (3) the business shall neither be financed nor managed by foreigners.

Any qualified wholesale dealer who has taken out a license is required to pay S.Y24 per annum. When the dealer has had salt transported from the salt depot, the matter must be reported to the Salt authorities concerned so as to have an inspection made over the salt, and when satisfied of the coincidence of the amount of salt with what has been entered on the transport certificate, the same certificate must be returned to the authorities who have issued it.

When a wholesaler sells salt to a retailer, the amount sold shall be entered on one of the salt sale cards issued by the Salt Transportation Office and handed to the retailer in order to show that the stock is no illicit goods. This procedure is required to be gone through each time, no matter what the amount of salt involved may be.

No retailer is permitted to go direct to the salt depot, and the qualifications for a retailer are the same as those for a wholesaler.

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The retail sale of salt to the consumers, too, must be reported upon to the Salt authorities concerned at the end of each month.

In the immediate environs of the salt depots within the radius of 10 Chinese *li* or 3⅓ miles, in which no wholesale or retail business in salt is permitted to a private party, any one wishing to buy salt may go to the nearest branch salt office and take out a permit on payment of the Salt gabelle. In case of the purchase of an individual falling short of 1 picul or 100 *kin*, several people may make a purchase conjointly. When the salt thus bought has been used up, the permit is to be returned to the salt office that has issued it.

If a wholesaler has been found guilty of transporting private salt or has forged permits, licenses, or certificates, or if a retailer has been found guilty of selling private salt, the offender will be caused to close his business and be punished to the full measure of the law.

As to inhabitants in the immediate neighbourhood of a salt depot, if any one, who has not long bought salt of the salt depot, or who, has bought only a small quantity of salt considering the number of the people of his household, is also liable to punishment in case of his being found guilty of using illicit salt.

For both Kirin and Heilungkiang Provinces, the Salt Purchasing Office at Yingkou buys salt and forwards it either by railway or by steamer to Vladivostok, whence to be sent to the destination by railway. The salt, on arrival at the destination, is taken into custody at the Provincial Depot to be distributed to its branches, accompanied with transport permits of Government salt. The branch depots then sell to Government salt dealers. Any of such dealers must be a Chinese citizen and have some other Chinese of sound financial status for guarantor, and must have taken out a sales permit from the Salt Transportation Office. A private citizen buying of the dealer is also required to obtain a consumption permit.

None of the dealers can fix the price arbitrarily. It is determined by the Salt Transportation Office, subject to alteration from time to time as occasion may require, by taking into consideration the salt gabelle, buying price, transportation cost, the size of population of the district, etc.

Even in Jehol and Mongolia, no salt is for free transportation. A permit must first be obtained on payment of the gabelle, and a transport permit will be issued. The buyer in each case will be subjected to an examination about the

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route of transportation, the point of destination, etc., and under no circumstance will be permitted to sell any salt while in transit, or sell the transport permit to another party. On reaching the destination, the transport permit is to have the date, etc., filled in and is to be returned by post to the Salt Purchasing Office, Yingkou.

All the above concern the internal control of salt business in China.

At the same time, no salt is permitted to be exported abroad, or none is to be imported from abroad.

In Article 15 of the Supplementary Regulations governing the Russo-Chinese Frontier Trade issued in the 7th year of Kuanghsu (1881), and also in Article 15 of the Regulations governing the Franco-Chinese Southern Frontier Trade, as signed in the 12th year of Kuanghsu (1886), salt has been included in the list of contrabands prohibited from both export and import, together with war supplies.

A similar provision is contained also in Art. 11 of the Supplementary Anglo-Chinese Yunnan-Burma Treaty, concluded in the 20th year of Kwanghsu (1894), and in Art. 3 of the Revised Import Tariff of China, as promulgated in the 28th year of Kwanghsu (1902).

Especially, in Art. 16 of the Regulations governing the Sino Japanese Commerce, mention is made to the effect that the Japanese are not permitted to engage in the transportation of table salt in the interior of China. It is also explicitly mentioned that no salt of Japanese origin shall be imported into China for the purpose of sale. A breach of any of the above provisions is made liable to punishment. An exception is made, however, of only a limited quantity of salt such as table salt packed either in bottles or tins, or such as has been certified for domestic consumption.

Salt Industry in Kwantung Leased Territory.

Concerning salt produced in the Kwantung Leased Territory, it is governed by the agreement concluded between Japan and China with regard to the establishment of the Dairen Custom House in 1907, by which agreement outputs in the Leased Territory are regarded as foreign product. On this account, no salt put out in the Leased Territory can be exported without.

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However, in view of the staff price of Government salt in Chinese territory, smuggling of salt from the Leased Territory into the adjoining regions is supposed to be going on.

Immediately after the occupation of the Leased Territory by Japan and prior to the operation of the above mentioned Agreement in 1907, Kwantung salt was smuggled actively into the interior to such an extent that the salt revenue of the Chinese Government concerned was perceptibly affected.

As a preventive, the Chinese side proposed to buy Kwantung salt, and Viceroy Chao-erh-sun of Manchuria opened negotiations with the Japanese Consul General at Mukden concerning the recovery of the management of the salt depots in the Leased Territory.

In the 1st year of Hsuan-tung (1909), the Chinese side signed a contract with the Japanese salt manufacturing companies for the purchase of 80,000 *koku* of Kwantung salt a year. But this contract was cancelled without taking effect, partly because the price quoted (G.Y1.81 per *koku*) was anything but moderate, and partly because of the position of Kwantung salt in the eyes of other Powers.

Consequently, Kwantung salt has had no opportunity to find a market in Manchuria and Mongolia. Still there appears to have been more or less smuggling carried on persistently.

This no doubt exhausted the patience of the Chinese authorities, who, in 1916, signed with the South Manchuria Railway Company an agreement regarding the transportation of Government salt to Kirin and Heilungkiang Provinces and also the control of privately-manufactured salt, and from April 1, 1917, no salt not accompanied with a transport certificate issued by the Salt Production Office of the Three Eastern Provinces is to be accepted at any station of the South Manchuria Railways outside the Kwantung Leased Territory.

Thus, the Japanese are debarred from handling in China salt put out in Chinese Territory, and moreover from handling even their own outputs.

Such arrangement is sometimes felt very inconvenient. In 1918, when Japan ran short of salt, the Japanese Government approached the Peking Government for the export of Chinese salt to the amount of 100,000,000 *kin*, but the negotiations dragged on slowly and had to be carried over the year.

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Looking back the history of the salt fields in the Kwantung Leased Territory, since the first lot of them were laid out at Pitsuwo, only half a century has elapsed, but since the Japanese took over the administration of the same, the salt industry has made a remarkable development. However, with the intervention of the untoward events and restrictions above mentioned, the development of this industry has met with a check.

Since markets have been exploited in Chosen (Korea) and been further extended in Japan and matters have been improved gradually, but until the salt crops in Japan have failed year after year recently and Kwantung Salt has pushed itself to the fore as the handiest substitute for home product to make up for its deficit, the growth of the Kwantung salt industry has been rather slow, as may be seen from the following table giving the areas of the salt fields :—

	Japanese Managed *tsubo*	Chinese Managed *tsubo*	Total *tsubo*
1906	—	3,799,876	3,799,876
1907	29,640	4,459,766	4,489,406
1908	3,405,572	4,405,676	7,811,248
1909	4,962,043	4,392,436	9,354,479
1910	5,135,750	4,429,821	9,565,571
1911	5,135,748	4,468,426	9,604,174
1912	5,394,593	4,260,010	9,600,603
1913	5,911,086	4,260,010	10,177,096
1914	7,957,793	4,394,605	12,351,398
1915	7,963,020	4,475,695	12,438,715
1916	7,963,020	4,475,695	12,438,715
1917	7,964,832	4,475,695	12,440,527
1918	7,964,130	4,475,695	12,439,825
1919	7,964,130	4,475,695	12,439,825
1920	8,510,389	4,608,608	13,118,997
1921	9,426,717	4,664,915	14,091,632

That the total area of the salt fields in the Kwantung Leased Territory went above 12,000,000 *tsubo* dates backs eight long years, and the fact that it failed to clear the next notch for five years speaks eloquently of the staying power of some agencies other than natural, seeing how bounteously nature has endowed the Kwantung Leased Territory for salt industry.

It may therefore be inferred that the ascent of the total area above 13,000,000 *tsubo* in 1920 and further rise above 14,000,000 *tsubo* in 1921 owe their origin to some favourable turn taken by the same agency.

(To be Concluded.)

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MANCHURIA ENLIGHTENING SOCIETY.

Whose Organ the "Light of Manchuria" is

What actuates us in our endeavours to open up Manchuria and Mongolia lies in realizing our ultimate ideal in the enlightenment and development of Manchuria and Mongolia. It will not do only to develop the natural and industrial resources, but the ethical and intellectual culture of the inhabitants must also be carefully husbanded and nourished, so that both mind and matter may be developed in harmony.

The Manchuria Enlightening Society raised its first cry in order to fill a sorely felt need. Its primary mission is to investigate and propagate the truths of the development of Manchuria and Mongolia. We shall studiously refrain from misleading the public by disseminating inaccurate or exaggerated reports, but shall steadfastly adhere to the truth or facts only.

It is urgently important that the truths regarding Manchuria and Mongolia should be made known clearly not only to Japan and China, but also to Europe and America. On this account, the establishment of the Manchuria Enlightening Society is found to have a serious significance of international character.

If happily, through the establishment and activity of this Society, the truths of the development of Manchuria and Mongolia should become topics of world wide interest, it would not be only an honour to those now actively engaged in developing these regions, but also a matter of congratulation to the world at large.

We might be permitted to add that the ultimate ideal and desire of this Society are to serve as the herald of all enlightening movements in future, thereby opening a new chapter in the annals of the world's civilization.

What is the Society Like.

a) Office.—The office of the Society is in the Municipal Office Building on Central Circle in the city of Dairen.

b) Society's Work.—The works of the Society include the following:—

1. Publication of the organ of the Society, The "Light of Manchuria."

2. Supply of general information through the Society and by other means, giving the results of such investigations and researches as may be conducted in the interest of the development of natural, industrial, and other resources in Manchuria, Mongolia, and Eastern Siberia.

3. To act as guide to intending investors in general in all kinds of enterprises in Manchuria, etc., and also to undertake any special investigation or research on application by promoters of all kinds.

4. To offer facility to travellers on inspecting visits to Manchuria, Mongolia, Siberia, Chosen (Korea), China, etc., to the end of importing accurate information and rendering their observations as close to truth as possible.

5. To use all kinds of means in order to propagate the true conditions obtaining in Manchuria, etc., and further to carry on the propaganda work for these regions through the medium of lecture meetings, exhibitions, etc.

6. To compile, publish, sell and distribute books, pamphlets, etc., bearing on Manchuria and Eastern Siberia.

7. To carry on other works necessary for disseminating information on Manchuria, etc., and also for fostering economic enterprises therein.

c) In carrying on the above work, the Society is divided into the following:—

Secretariate,
Research Department,
Publication Department,
Intelligence Department, and
Accounting Department.

d) Any one wishing to join the Society is requested to send in a written application, giving

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the name and address, accompanied with the membership fee for not less than three months paid in advance.

e) The membership fee, entitling the member to a copy of the monthly organ, costs 50 sen (½ yen) per month and ¥6 per annum.

Remittances.

All remittances to this Society may be made most conveniently and safely to Transfer Savings No. 2850, Dairen. No receipts for the same will be issued, but instead the Society's monthly organ will be sent.

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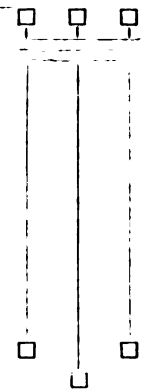

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USES OF BEAN OIL AND ITS IMPROVEMENT.

By Mr. S. Hirayama,
in the service of Dairen Branch of
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Bean Oil as Industrial Material.

The two principal uses of Bean Oil used to be as material for paint- and soap making. Prior to the War, Bean Oil was quoted very low, leaving ample room for competition as substitute for linseed oil. Even as soap making material, its comparatively moderate price by the side of tallow, cotton seed oil, and cocoanut oil helped it to extend its market by degrees in Europe and America even prior to the Great War, so much so that Manchurian Bean Oil gained quite a foothold in those markets.

The amount wanted reached an enormous quantity, and every indication pointed to the demands there being as high as to require the whole of the annual outputs of Manchurian Bean Oil ranging from 120,000 tons to 200,000 tons.

The best part of those outputs belongs to what may be called "export surplus," and admits of being held in stock till the terms on the Western markets have become more negotiable. Indeed, there were times when they were anything but workable, but every time some waiting on the exporters' part was rewarded.

The export of Bean Oil thus steadily increased, and so did the outputs. Still they could not quite keep pace with the increasing demand in the West.

It may be mentioned that originally the bean milling industry was founded for the production of Bean Cake mainly to supply Japan as fertilizer.

And on occasion, with the brisk export of Bean Oil, Bean Cake was produced quite in excess of demand. But, it is to be regretted that the disposal of Bean Cake has always exercised a restraining influence upon the production of Bean Oil.

The great War, as it progressed year after year, disjointed the relation of supply and demand of general stores, and as to the primary necessaries, various

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new methods of production on an extensive scale were discovered. In particular, the manufacture of butter, lard, etc., and their substitutes became revolutionized.

Annual Fair of Niangniang Miao Temple near Tashihchiao
(Goddess of Matrimony, Propagation, and Optics.)

It was admitted that cow's milk and other animal fat fell far short of meeting the immense need, and thus the ways of making suitable substitutes for them out of vegetable fat were sought and opened.

In Europe and the United States, the study of this theme was taken up like a 'rage' and fresh inventions and discoveries followed one another. The keen interest in the same topic has yet abated in no wise, and a long stride forward is being looked forward to.

As to Bean Oil itself, it has become available as a food-stuff, a substitute for animal oil by process of hydrogenation.

Thus, Bean Oil, which used to be regarded as only an industrial oil, has been raised at a push to the plane of an edible oil, the sphere of demand being thereby enlarged almost without limit.

Edible Vegetable Oils.

The quarter, in which vegetable oils have encroached on the province of animal oils, lies in the direction of oleomargarine and imitation lard. The wonderful invention was effected also during the War.

The making of oleomargarine dates back to the period of the Franco-Prussian War, during which a French chemist invented how to make butter, for which cow's milk used to be the only material, from other animal oil

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He christened it oleomargarine. This industry duly spread to Italy, England, Holland, and other countries in Europe.

In 1906, what is known as nut margarine was put out of vegetable oil, and in 1913, it was established that, through the hydrogenation of liquid fat, any kind of oil could be made material for oleomargarine.

It was in 1916 that out of artificial butter made from vegetable oil, artificial butter could be produced.

Margarine industry has made a wonderful progress in the course of only ten odd years.

As to artificial lard, its manufacture has passed through a much similar course to the margarine industry. Especially, by means of the hydrogenation of vegetable oils, the manufacture of artificial oil has reached a nearly complete stage, and at present, there exists a competition among the manufacturers to steal a march on their rivals for a greater efficiency of the machinery.

Let us now see how artificial butter is made.

There are several methods of compounding artificial butter.

(a)	Premier juice	15%	Melting point, 25° C.
	Palm Kernel oil	50%	
	Cocoanut oil	15%	
	Cotton-seed oil, Bean oil, or Peanut oil	20%	
(b)	Oleo-Stearin	15%	Melting point, 24½
	Cocoanut oil	45%	
	Palm Kernel oil	20%	
	Cotton-seed oil, Bean oil, or Peanut oil... ...	20%	
(c)	Cocoanut oil	70%	Melting point, 21½° C.
	Palm Kernel oil	10%	
	Cotton-seed oil, Bean oil, or Peanut oil	20%	
(d)	Oleo-Stearin	65%	Melting point, 40° C.
	Cotton-seed oil, Bean oil, or Peanut oil	20%	
(e)	Premier juice	37%	Melting point, 24° C.
	Oleo	21%	
	Cotton-seed oil, Bean oil, or Peanut oil... ...	42%	

The above compounding methods are subject to variation according to the manufacturers, who have their own wares to commend to the favour of the consumers. Still, the exact percentages of the constituents and what these constituents are guarded secrets which are jealously kept from probing by outsiders. This much is, however, known that, in the preparation of artificial

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butter, the percentages of the constituents are liable to a certain latitude of variation, between the warmer and colder months of the year, even though they themselves may remain the same.

Artificial lard is being put out in the largest quantity in the United States. But, it is conjectured that, up to 93% or so, vegetable oils only are used. However, it remains a riddle at what percentages such easily congealable oils as cocoanut oil, palm kernel oil, etc., and liquid oils like cotton seed oil, Bean oil, peanut oil, etc., are compounded together. It is known that at some factories, Bean Oil is brought into use in a good quantity, whilst, at other plants, more expensive cotton-seed oil, refined, only is employed. It is often noticed that, singular to say, the outputs in the latter case are not quite so good as those in the former case. All these differences may be ascribed to the secrets of manufacture applied to the different methods. No wonder that there is the keenest competition waged among the rival manufacturers to outstrip the others in the invention of some more advantageous secrets.

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Tendency of Increase in Consumption of Vegetable Oils.

Judging by the chain of events that have led to the manufacture of substitute butter and lard for edible purposes from vegetable oils, and tracing what course this particular industry has followed to attain its present importance, it is easily learned how Europe has been in the lead with regard thereto, and at what a greater pace, the outputs of substitute butter and lard have been increasing on the

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Continent than in Great Britain. Even in the pre-War times, Dutch margarine used to be imported into Great Britain in considerable amount. In the United States, this industry received a strong stimulus from the colossal War, and this has worked out a rapid advance.

Only, in Europe, its countries have not yet quite recovered from the severe economic shocks inflicted upon their industrial activities by the War, and the above mentioned enterprise of making substitute butter and lard is no exception. On the other hand, the United States is possessed of an abundance of oil producing capacity and is giving full vent to her amazing industrial vigour and creative faculty. Therefore, she has been credited with new superior inventions and has had the satifaction of increasing the production. Her further potentialities in this line of activity seem to hold a wonderful promise.

Wuhingkuan Temple, Chienshan (Thousand Hills)

What the exact productions of lard and margarine in the different European countries and the consumptions of the different kinds of vegetable oil can hardly be incorporated into reliable statistics, partly because of want of authentic data amidst the confusion and exitement of the War and partly because of lack of unification in the methods of the different countries in the preparation of statistics.

We shall now proceed to give below the productions in the United States, which was, in a sense, a junior in reference to the industry in question, during and after the War:—

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a) Production of lard and its substitutes.

	Lard ton	Substitute lard ton
1914	826,000	568,500
1916	986,500	501,350
1917	788,500	586,500
1918	1 044,500	573,000
1920	968,000	500,000

About 93% of substitute lard in the above table was put out from vegetable oil.

b) Production of butter and artificial butter.

	Butter ton	Artificial butter ton
1914	853,000	71,950
1916	817,500	101,200
1917	784,400	145,000
1918	765,000	177,700
1919	779,000	185,600
1920	721,200	185,000

It is particularly noteworthy that artificial butter made from vegetable oil only developed at a singularly quick pace as indicated under: —

	Ton
1916	971
1917	10,900
1918	44,480
1919	71,350
1920	95,760

From the rapid advance, as may be seen from the above tables, in the increase of demand for vegetable oils, particularly as edibles, the future of Manchurian Bean Oil, too, may be pictured as decidedly glowing.

Values of Different Kinds of Vegetable Oil.

As already mentioned, vegetable oils admit of being put to similar uses to animal oils by subjecting them to technical processes.

Such as are used most extensively as edible oils in the European and American markets are, however, confined to cocoanut oil, palm kernel oil, cotton seed oil, peanut oil, and Bean Oil

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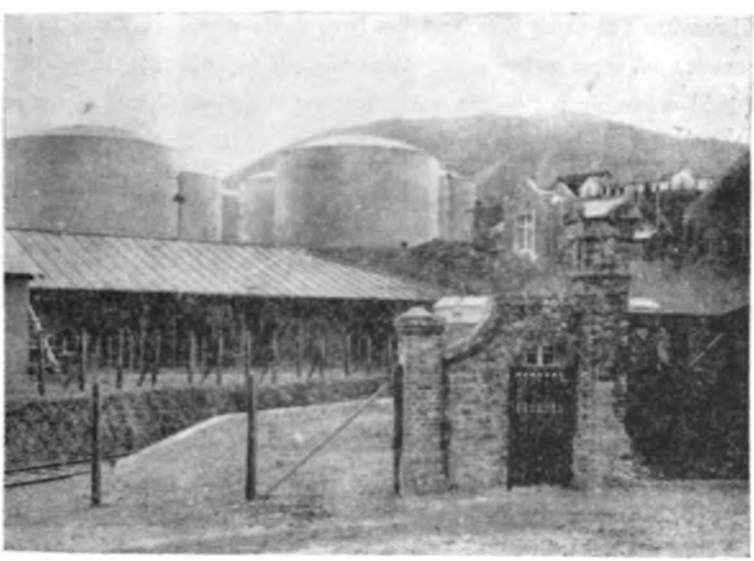
Truly enough, there are, besides, such superior oils as rape seed oil, sesamum seed oil, and olive oil, but they are each handicapped either with dearness of price or inadequate supply, which disqualifies them from use as material for making substitute butter and lard.

Then, as material for substitute butter and lard, there is really little to choose among the five kinds of vegetable oil above referred to.

For instance, speaking of Bean Oil, which is held by many people as of inferior quality to the others, it may be placed at a level with cotton seed oil by refining it. In many cases, refined Bean Oil is mixed with Cotton seed oil and is offered to the market under the title of refined cotton seed oil. This is as often true also with peanut oil.

In fact, once Bean Oil or cotton seed oil gets hydrogenated, either is actually as good as either cocoanut oil or palm kernel oil, hardened, save for the consideration of working cost and loss resulting from the refining process.



Bean Oil Tanks of Dairen Branch, the Mitsui Bussan Kaisha.

It naturally follows, therefore, that any manufacturer with an eye to business will be inclined to use as large a quantity of the cheapest kind of oil as the consideration of working cost and loss resulting from the refining process permits.

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Under such circumstances, it is only proper that Bean Oil should be cheaper-priced than either peanut oil or cotton seed oil, by reason of its exacting the highest producing cost and loss from refinement. It is no less understandable that only a slight margin of price divides peanut oil from refined cotton seed oil.

In other words, among these four kinds of rival oils, not including cotton seed oil, the highest grade oil, their prices tend to be regulated, punctuated with the measure of differences between their respective working cost and loss from refinement.

Quality of Manchurian Bean Oil.

Turning to the existing situation of the bean oil mills in Manchuria, they appear to have on their topmost thought the production of the largest amount of Bean Oil from the same amount of Beans, so as to gain an advantage over the others. Naturally, the outputs lack in uniformity in quality. Some has a darker colour betraying that much blue bean has been used; others are found to have a larger amount of water or free acid. Generally, all the different kinds of Bean Oil of local origin are put on the market under the same head, and even a product of uncommon excellence only gives an extra profit to the foreign buyers to the extent of the less working cost and loss from refinement its excellent quality ensures. It is a pity that none of the profit is shared by the producer or the local dealer.

The above is the very reason why the unification and improvement of quality of Bean Oil is a matter of the most urgent importance to its producers and dealers in Manchuria.

Graduating Standards for Bean Oil.

The standards by which Bean Oil is graduated on the Western market are (1) Amount of free fatty acid; (2) Amount of water and impurities contained; (3) Colour; and (4) Presence of adulterated oil.

American Standards.

The standards in force in the United States may be quoted below:—

(1) Refined Soya Bean Oil.

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Free fatty acid to be not more than 15/10,000; colour to be not more than 70° yellow and 9° red by Robiliont tintmeter; no water or impurity to be found.

(2) Prime Crude Soya Bean Oil.

No water or precipitate to be found; loss from refining process not to be more than 5%; colour not to be more than 70° yellow and 9° red.

(3) Crude Soya Bean Oil.

Water and impurity to be not more than 1.5%; loss from refining process to be not more than 7.5%; colour not to exceed 70° yellow and 11° red.

(4) Fair average quality crude soya bean oil.

Water and impurity to be under 1.5%; free fatty acid to be less than 2%.

Loading bulk oil into steamer at Inflammable Goods Pier, Dairen.

It may be added that Manchurian Bean Oil is mostly graduated as the fair average quality crude bean oil.

To Unify and Improve Quality of Bean Oil.

It would be quite easy to raise the price of export Bean Oil by two or three yen per 100 *kin*, if only Manchurian Bean Oil could be unified in quality under a certain standard and, at the same time, be improved in quality. In such happy

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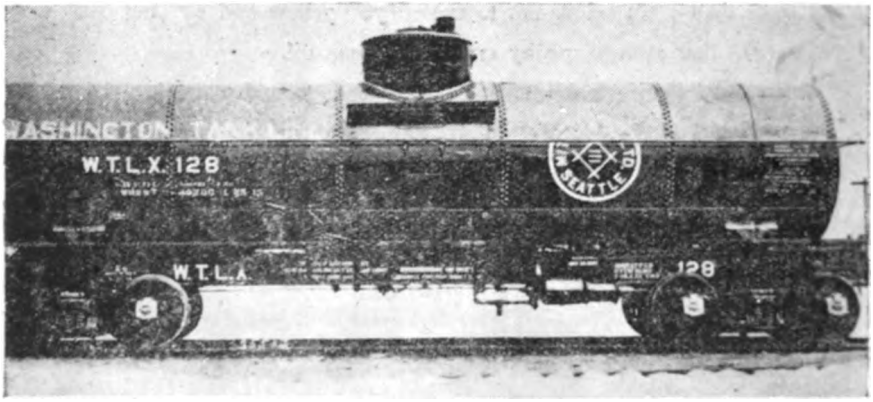
event, the market therefor would doubtless be increased, since the Western patrons would be able to obtain any given standard of Manchurian Bean Oil in the desired quantity.

Mixed Storage System of S. M. R. Co.

In conclusion it may be pointed out that what is now known as the Mixed Storage systems, as inaugurated and maintained by the South Manchuria Railway



Bean Oil Tank Car owned by the Mitsuis at Seattle.

Company with regard to Beans and Bean Cake, met stout opposition from various quarters, which the actual benefits accruing therefrom in the unification and improvement of quality have succeeded in stilling at last.

From these living examples, the extension of the Mixed Storage System to Bean Oil by the same Company, as now in project in fact, will go a long way to encompass the desired end.

The objections of the parties directly interested to the proposed extension of the Mixed Storage System to Bean Oil may well be anticipated, on the ground of the increase of incidental export charges, aggravation of the speculative temperament, risk of market-cornering, etc.

However, when the extent of gain is considered that will be obtained from the advance of price to the total production of Manchurian Bean Oil ranging in amount from 120,000 tons and 200,000 tons a year, all these objections may well be overruled, especially as the proposed change will moreover accelerate the develop-

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ment of the bean milling industry in Manchuria and, on top thereof, the enhancement of the reputation of Dairen as export port of Bean Oil.

Remark :—The Mixed Storage system was inaugurated first with Bean Cake and then with Beans.

Official examiners graduate the goods presented for Mixed Storage and reject such as fall short of the standard, graduating such as has been passed by them into three different grades.

In actual delivery of goods bargained for, the Railway Company which holds the goods under its custody delivers the given quantity of goods of the given grade, nevermind what their origin is. Thus, the buyer may expect to take delivery of his purchase at the appointed date, the transportation of the very goods actually sold by the seller from where they are to the desired point of delivery being absolutely eliminated out of consideration.

Moreover, the approved banks, relying on the good faith of the Railway Company, the custodian of the goods, are prepared to finance the goods-owners on the presentation of the warehouse warrants issued on the goods by the Company.—Ed. *L. & M.*

SALT INDUSTRY IN KWANTUNG LEASED TERRITORY.

By Mr. T. Kimura,
in the service of Oriental Development Co., Dairen

PART II.

Continued from April Number, 1922.

Kwantung Leased Territory for Salt Manufacture by Natural Evaporation.

Manufacture of salt may be thought simple and easy. Nonetheless it requires careful consideration. Economic conditions being left out of account, salt could be made by taking water off sea water. But, to obtain a dependable supply of table salt at moderate rates is a matter of no particular ease. This accounts for cases, in which people are obliged to put up with stiff salt prices and are harassed with insufficient supply, although they have an unlimited reserve of sea water for raw material.

Curved coast lines fringed with fine beaches do not always guarantee that they are productive of salt on favourable terms.

In the Orient, in which rock salt is scarce, sea water must be relied upon for salt supply. Above all, evaporation by the sun is the cheapest. However sundry factors are necessary to make it commercially negotiable.

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There are more factors than one can conveniently enumerate, that will make up the necessary conditions for good salt fields, which may be subdivided into natural and human factors.

A. Natural Factors.

What we call natural factors contain meteorology, topography, soil, and sea. They are the most important assets on which the success or failure of the enterprise hangs.

The ideal requirements for salt fields may be summarized as under:—

1. Continuation of fine weather; strong sun's rays; dry atmosphere; constant presence of suitable wind.
2. Open country; absence of rivers and high mountains; gently sloping beach in the receding sea-coasts.
3. Fine clay mixed with fine sand resting on a hard stratum.
4. High specific gravity of sea-water; a wide difference between flood and low tides.

The fulfilment of all the above requirements will be more than one may expect reasonably of any place in the world.

The Rosieres (?) salt fields, France, may be cited as a fine example lacking in requirements mentioned in (1); whilst those about Fangchiatun (Hokaton) in the district under the Ryojun Civil Administration may be quoted among such as are found amiss with regard to (2).

How far does the Kwantung Leased Territory fulfil the requirements for a salt producing centre?

We shall now proceed to weigh the natural advantages and disadvantages of the Leased Territory.

1. Meteorological Conditions.

By the natural evaporation process, the sea-water is exposed to the action of both sun and wind, so as to accelerate the evaporation of the water and the gradual condensation of the sea-water, in order to obtain a crystal of sodium chloride.

Thus, the meteorological conditions have a close and direct relation to salt production, the wind, atmospheric pressure, temperature, etc., together with the conditions of their variations, all counting as factors claiming due recognition.

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Table VI.

a. The Higher, the Better.

From Imperial Statistics No. 39.

	Mean Temperature	Sunshiny time	Velocity of wind in metres per second	No. of fine days in the year	Evaporation amt. in millimetres.
Ryojun (Port Arthur)	10.0	63%	5.5	131	1601
Dairen	10.2	61%	7.5	122	1465
Tainan (Formosa)	23.1	61%	4.5	60	—
Chemulpo	10.6	58%	5.1	78	1459
Pingyang	9.1	61%	2.7	97	—
Tsingtao	12.3	63%	7.0	92	1725
Ajino	14.0	53%	3.0	41	—
Alameda (California ...	13.3	—	4.5	247	—
Salt Lake City (Utah)	11.0	62%	6.2	153	—

Table VII.

b. The Lower, the Better.

	Humidity	Cloudiness	No. of wet days	No. of stormy days	Mean rainfall in millimetres
Ryojun (Port Arthur)	67%	3.9	64	155	550
Dairen	67%	4.4	64	237	644
Tainan (Formosa)	79%	5.5	166	61	1,744
Chemulpo (Chosen)	7?%	5.3	113	130	892
Pingyang "	72%	4.8	91	23	978
Tsingtao	71%	5.0	68	215	452
Ajino	75%	6.3	103	48	1,051
Alameda (California)	75%	—	63	11	—
Salt Lake City (Utah)	—	—	89	—	—

Table VIII.

	Atmospheric Pressure
Ryojun (Port Arthur)	762.5 millimetres
Dairen	762.6 "
Tainan (Formosa)	753.6 "
Chemulpo (Chosen)	762.4 "
Pingyang "	762.4 "
Tsingtao	762.6 "
Ajino	761.3 "
Alameda (California)	761.3 "
Salt Lake City (Utah)	761.3 "

Among the above mentioned places, Ryojun (Port Arthur), Tainan, Tsingtao, and Ajino, and also the two places in the United States have salt fields in their

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immediate vicinity. In the case of the others, they stand for such as lie near them.

It may be added that, at Ajino, Japan, salt is made by boiling sea-water.

The above three tables will serve to show what natural advantages and disadvantages Port Arthur and Dairen have, compared with other salt centres.

Of course, all these tables give the data for the whole of a year.

However, each salt field has its own producing season, so it is not always necessary or even convenient to calculate every item by the year. Especially,

Flooding Salt Field.

the factors in Table VI being directly concerned with salt manufacturing operations, the data for the operating season, if such be obtainable, will do quite well. As regards, Tables VII and VIII, a calculation on the basis of the annual means is thought more proper.

Each is favoured in one way, but handicapped in another way.

To make an excellent salt centre, all the factors must be fulfilled in a fair measure, and the preponderance of any single advantage, however important, will be found only of a little value, unless the other advantages, too, duly help.

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For instance, at Ajino (Japan), the temperature is the highest. Nonetheless, it is sadly wanting in other requirements, and this leaves it out of the list of fine salt centres.

From this point of view, the Kwantung Leased Territory may be pronounced as very favourably endowed by nature.

The wind also forms a important asset in salt manufacture. Even the wind of the same velocity gives a variation of results according to its directions because of there being a variation in drying effect.

In the Kwantung Leased Territory salt fields, the drying wind blows generally from the northwest, whilst a moist laden wind takes the southeastern direction.

Still, the mean direction of wind in the Leased Territory throughout the year is north northeast at Port Arthur and northwest at Dairen, much to the advantage of the salt manufacturers.

The monthly means of the direction of wind are as under:—

Table IX.

According to the report of Meteorological Observatory, Kwantung Government, for 1920.

	Port Arthur	Dairen		Port Arthur	Dairen
January	N. 26° E.	N. 12° W.	July	S. 34 E.	S 15° E.
February ...	N 12° W	N 12° W	August	S. 53° E.	S. 24° E.
March	S. 89° W.	S. 1° W.	September ...	N. 10° E.	N. 13° W.
April	S 87° W.	S. 31° W.	October	S. 25° W.	S 88° W.
May	N 62° E.	S 14 W.	November ...	N. 10° W.	N. 54° W.
June	S. 50° E.	S. 29° E.	December ...	N. 40° W.	N 30° W.
			Annual means...	N. 17° E.	N 55° W.

In passing, Japan proper is unfit for salt manufacture by natural evaporation on account of the uncommon excess of both rainfall and humidity, as may be seen from Table VII.

By the way, the above meteorological tables have been prepared from the data of the past twenty years.

The fact that the rainfall in Japan is exceptionally high will fully account for the persistent pursuance of the boiling method for salt manufacture in a country favoured with so long coast lines as Japan.

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2) Physiographical Condition.

The physiographical conditions, besides being directly related to salt industry, affect the meteorological conditions, and are entitled to due recognition.

a) Mountains and Hills.

High mountains and dense forests tend to catch the moisture in the atmosphere and to cause the vapor to congeal, giving birth to rain, etc.

In addition, the ranges of mountains and hills are apt to turn the direction of wind and to check its progress, and to slacken its velocity. If moist-laden wind is turned or checked, it will make for salt manufacture, but the case will be reversed in the event of its being a dry wind. Among the salt fields in the Kwantung Leased Territory, the disadvantage referred to above is experienced, although in only a slight measure, in part of Pulantien (on the boundary line of the Leased Territory), Shuangtaowan (not far from Ryojun, Port Arthur), etc. But such disadvantage is far from tipping the general scale of the salt industry of the Leased Territory.

There is an area estimated at 3,000,000 *tsubo* near the mouth of the Teng-Shaho River, which is counted as one of the most promising localities to lay out salt fields in. It is sheltered by the Chengerhshan Hill range to shut off the northeaster accepted as detrimental to salt manufacture.

Among fine salt grounds elsewhere, there are over 9,000,000 *tsubo* along the beach of the town of Pitsuwo, of which a photograph is reproduced at the beginning of this article; 15,000,000 *tsubo* on the shore of Sankuanmiao, and 15,000,000 *tsubo* along the shore of Hou-Santaowan.

b) Rivers.

The water of rivers contains an incomparably smaller percentage of salt than sea water. The river water has certainly the effect of diluting the sea-water at the mouth where it is emptied. Any such effect will be only trifilingly felt when the rivers are small. But, when it is a large river, the specific gravity of the sea-water near its mouth is affected more or less. Such holds true with the Sacramento River

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discharging itself into the San Francisco Bay, the Tai Doko emptied into Kogyo Bay in Chosen (Korea), etc.

To cite a more conspicuous instance, the water of the Mediterranean Sea contains 3.4-3.5% of salt, whilst in the Black Sea connecting therewith by the

At Salt Field.

Straits of Dardanelles and Bosphorus, the percentage drops to 1.8-1.85%; the percentage descending to even half the last mentioned at the mouth of the Danube.

Next, a river, which remains shrunk up in dry weather, but is ready to be flooded at a heavy rain, is likely to do damage to the embankments protecting the salt fields.

In the Kwantung Leased Territory, the only river of importance is the Piliu running near the boundary line. There is not a river, in which water flows in a liberal quantity all the year round, in the existing salt grounds or any place likely to be converted into salt grounds. In some cases, there are rivers, but they belong to the class of nominal ones, which want a heavy rain to cause a freshet.

The Piliu River, above referred to, takes a southeastern course and is gathered into the Yellow Sea. But, it affects the salt fields about its mouth but inconsiderably.

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There is another river by the name of the Tsantzu River which flows past the west of Chiahsintzu salt fields near Pitsuwo. But, space is reserved thereabout for the salt gardens against a possible flood.

However, in the planning of an embankment for the salt fields, allowances should be made not only for a possible freshet, but also for the stormy waves at the flood tide. There are also the Chingshui River and the Ta-Shaho. Both have their mouths not far from the Pitsuwo beach. There is a possibility of getting 7,800,000 *tsubo* of new salt fields along the Pitsuwo beach, if properly planned.

Again, the Teng Shaho River is another of decent size, emptying itself into the broad beach at Hsiao-Yenchang in the district under the Pulantien Civil Administration. This river has been surveyed to have the maximum range of rising 7 feet, according to the observations of the Kwantung Government. Provided with an embankment, the locality invites exploitation, although the area available may be somewhat curtailed.

A point that may be noted is that the earth and sand that may be sent down the river into the sea coast is liable to cause a deterioration of the surface earth kept otherwise in good condition.

About Hsiao-Yenchang, above mentioned, at the mouth of Teng-Shaho, also referred to above, there is still left a considerable area available for the purpose, but, owing to the constant deteriorating effect of the surface earth, only about half the area is utilized.

There are no other rivers worth mentioning in the Leased Territory, with reference to the salt industry.

(C) Plains.

An open country bordering the sea is most desirable for the laying out of salt grounds.

Such ideal localities are few in the Leased Territory.

The Leased Territory encompasses the small peninsula at the southern extremity of what is known as Liaotung Peninsula.

Its northern boundary is demarkated with a straight line drawn from the village of Hsiao-Huangchiatun at 70 metres north of Pulantien Station to Chinchangtien on the upper part of the River Pilin. Its area consists of

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1264 square miles, apart from the coast islands, the total area amounting to 1367 square miles. This small peninsula is intersected with chains of hills, and has little to suggest its being part of Manchuria, accepted generally as an expanse of level plain. However, the fact of its being a strip of peninsula lays itself exposed to the sea breeze.

The Leased Territory is washed by the Gulf of Pechili on the northwest, and this keeps it beyond reach of what is known as Mongolian duststorm. Still, this visitation, which, when it is here, obscures the sun quite as much as at a solar eclipse and fills the air with the finest particles of yellow dust, will take the Leased Territory by storm once or twice a year.

The Mongolian duststorm, because of its infrequency, scarcely affects Kwantung salt, although there has been some vague impression to the contrary.

It is true that Kwantung salt is not remarkable for the purity of colour, but this is owing to a cause other than duststorm.

3) Earth.

In ordinary salt fields, where salt is made by natural evaporation, the evaporation and crystallization beds are laid out on the natural surface earth. On this account, this surface earth has an important bearing on the quality and quantity of output.

The best surface earth ought to consist of loose fine sand and fine clay, which are almost impervious to the sea water, and which present less difficulty to the work of laying out, repairing, when necessary, etc. The terrigenous deposits are composed mainly of earth and sand sent down the rivers, or stones and pebbles washed by the sea water. In an enclosed sea or bay, silt is liable to get deposited on the shore.

In some exceptional places, drift wood gets stranded; or the sea weeds get decayed; or shells of all kinds get heaped. The surface earth may be affected thereby.

The shore lines of the Leased Territory are not included among such exceptional cases.

Although the surface earth of the shores of the Leased Territory has not yet gone through a close scientific analysis, a rough estimate of fine sand and fine

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clay is placed at 60% and 40% respectively at the Shuangtaowan salt fields; at 80% and 20% on the Wutao Group on the northwesten coasts of the Leased Territory; at 40% and 60% about Pulantien; and at 10% and 90% about Pitsuwo.

All these places are the leading salt grounds, and still the relative percentages of sand and clay show so wide a magin of variation.

There is another somewhat curious phenomenon. The outputs of the different salt fields also vary considerably according to places.

It would be easier to understand this difference, if the salt fields were worked under different managements. But, at present, in the Leased Territory at least, all the salt fields lie under a unified management. It may be not far from right that the composition of the surface earth has got a good deal to do with the difference in output.

About Shuangtaowan near Port Arthur, which has the finest grounds in the Leased Territory, the ratio of clay to sand is 4 to 6, whilst about Pulantien and Pitsuwo, where the ratio is reversed, the production is found considerably lower.

This seems to go far to bear out the above view.

Among the places that may be exploited anew, an area amounting to about 1,200,000 *tsubo* west of the Tsantzu in the Pitsuwo district is expected to be slightly better than in Pulantien, that is to say, the ratio of clay to sand is placed at 4.5 to 5.5. An area of about 4,500,000 *tsubo* at the west of Pitsuwo towards the Chingshui River is ranked about the same as Pitsuwo, whilst an area of about 1,950,000 *tsubo* Tashabo way is rated to be somewhat better. The tract about Hsiao-Yenchang in the Pulantien district, amounting to about 1,050,000 *tsubo*, is much allied to the west of the Tsantzu River. Then, about 1,500,000 *tsubo* about Sankuanmiao and about 900,000 *tsubo* at Hou-Santaowan may be put at the level of Pulantien.

The above gives only a rough idea. Nonetheless, it may be said that what are now included in the area for future exploitation belong to the passable class.

The nature of the surface earth of the land adjoining the salt fields has also something to do with the quality and colour of output. However, in the Leased Territory, as well as elsewhere, little untoward effect is experienced from this source.

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For reference sake, a table of analysis of soil about Sanshilipu just south of Pulantien, and elsewhere is given under:—

Results of analyses by S. M. R. Co. Central Laboratory.

	Mechanical constituents		Chemical constituents % contained in		
	Pebbles & earth	Fine earth	1 Water	2 Humus	3 Ignition loss
Saukouchiantzu 18 miles north of Yingkou	—	100.00	4.08	1.00	6.00
Heiyukou	0.06	99.94	7.10	1.05	9.03
Sanshilipu					
a) Upper layer	10.50	89.50	1.55	0.41	3.27
b) Intermediate layer	2.50	97.50	1.56	0.47	4.44
c) Lower layer	17.50	82.50	3.87	1.15	5.73
d) Salt layer between (b) and (c)	19.00	81.00	3.02	0.42	0.63

	Soluble in hydrochloric acid					
	4 Total nitrogen	a Silicous acid	b Alumina	c Ferrous oxide	d Manganic oxide	e Lime
Saukouchiantzu 18 miles north of Yingkou	0.60	0.15	0.33	2.24	0.11	1.30
Heiyukou	0.71	0.11	5.60	5.51	0.18	0.79
Sanshilipu						
a) Upper layer	0.17	0.25	3.69	3.98	0.48	1.68
b) Intermediate layer	0.11	0.30	4.53	4.58	0.68	1.03
c) Lower layer	not detected	0.16	4.50	4.05	0.48	1.28
d) Salt layer between (a) and (b)	0.08	0.29	3.49	3.31	0.61	1.52

	Soluble in hydrochloric acid				
	f Magnesia	g Sulphuric acid	h Phosphoric acid	i Potassium	j Soda
Saukouchiantzu 18 miles north of Yingkou	0.02	0.03	0.55	0.52	—
Heiyukou	0.18	0.12	0.87	0.87	—
Sanshilipu					
a) Upper layer	1.16	0.08	0.14	0.41	0.42
b) Intermediate layer	1.35	0.07	0.14	0.47	0.31
c) Lower layer	1.58	0.16	0.13	0.50	0.13
d) Salt layer between (a) and (b)	1.28	0.39	0.09	0.78	0.73

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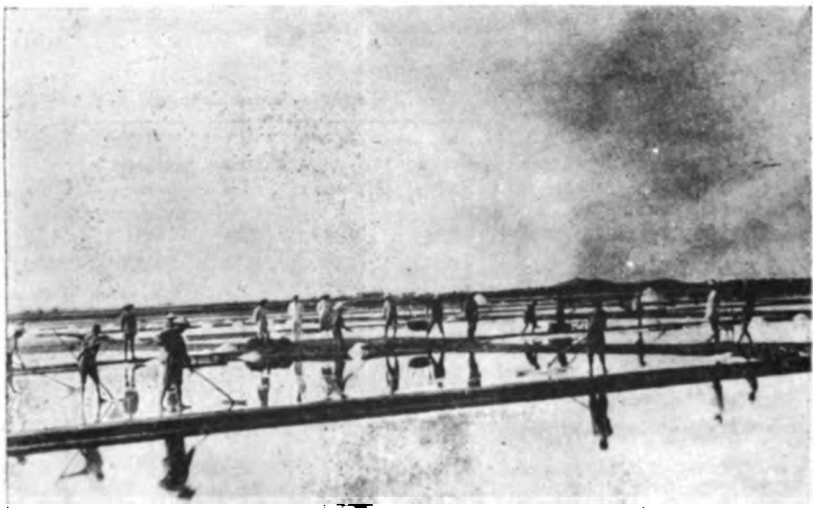
	6 Insolubles in hydro-chloric acid	7 Insoluble in hydroc-hloric acid; Mineral	8 Soluble in sodium carbonate; silicic acid	9 Chlorine	10 Total potassium $Na_2 Co_3$	Remarks date of analyses
Ssukouchuantzu (18 miles north of Yingkou)	80.25	78.39	3.81	0.544	0.003	Sept. 1, 1920
Heiyukou	66.49	61.61	16.78	0.001	0.18	"
Sanshihlipu						
a) Upper layer	85.41	83.66	3.56	0.355	0.21	May, 1920
b) Intermediate layer	83.20	81.9)	3.54	0.284	0.18	"
c) Lower layer	81.53	80.2‡	5.54	1.0y)	0.12	"
d) Salt layer between (a) and (b)	75.31	74.30	3.23	2.234	0.14	"



At Salt Field.

4) Marine Factors.

Since sea-water makes the material for salt making and salt fields are always laid out on the sea shore, the beach and sea water constitute two important factors for salt manufacture by natural evaporation.

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a) Beach.

By the term "beach," the area between the highest and lowest tide lines is meant.

The beach is absolutely indispensable to the natural evaporation method and also to a few of the sea water boiling methods.

In laying out a salt field by natural evaporation, suitable sites must be selected at a place where salt industry may be commercially negotiable.

According to the "Salt Industry in Kiaochou Bay and the Kwantung Leased Territory," as published by the Kwantung Government in March, 1921, the suitable sites where salt fields may be laid out anew in the Leased Territory totalled 13,995,000 *tsubo*, being a decrease by 11,025,000 *tsubo* from what was given in the List of Suitable Sites for Salt Fields, as published by the same Government under date of October 1, 1912. The above decrease may be accounted for as the extent of the new fields laid out in the intervening period.

However, as may be seen from Table V, the area of the salt fields laid out between 1912 and 1921 is given as 4,431,000 *tsubo*, which materially differs from the above mentioned decrease of 11,025,000 *tsubo*. It is likely that, in 1912, it was impossible for the Kwantung Government to conduct reliable investigation. For instance, in the belt between the Tsuntai River and the Ta-Shaho, which is now estimated at 6,000,000 *tsubo*, the total available area was computed in 1912 at only one twentieth or 300,000 *tsubo*, consisting of 240,000 *tsubo* at Ta-Shaho and 60,000 *tsubo* at the mouth of the Chingshui River.

(b) Sea-Water.

According to a specialist, the aggregate sea area of the world is about 361,280,000 square kilometres, taking up 70.85% of the total surface area of the earth.

The sea area may be tabulated as follow, if divided by every ten degrees of latitudes:—

Table XI.

The sections, in which the land area is larger than the sea-area, extend only from 40° N.L. to 70° N.L., although nothing definite can be known about north of 80° N.L. and south of 60° S.L.:

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	Sea area (in 1,000,000 square kilometres)	Land area	Ratio sea	Ratio land
90° N. to 80°	3.6	0.4	9.0	1.0
80° to 70°	8.5	3.1	7.3	2.7
70° to 60°	5.4	13.5	2.8	7.2
60° to 50°	11.1	14.5	4.5	5.5
50° to 40°	15.0	16.4	4.8	5.2
40° to 30°	20.8	15.7	5.7	4.3
30° to 20°	25.1	15.1	6.2	3.8
20° to 10°	31.5	11.3	7.4	2.6
10° to 0	34.0	10.0	7.7	2.3
0 to 10° S.	33.6	10.4	7.6	2.4
10° S. to 20°	33.4	9.4	7.8	2.2
20° to 30°	30.9	9.3	7.7	2.3
30° to 40°	32.3	4.2	8.9	1.1
40° to 50°	30.4	1.0	9.8	1.1
50° to 60°	25.4	0.2	9.9	0.1
60° to 70°	17.1	1.8	9.0	1.0
70° to 80°	3.1	8.5	2.7	7.3
80° to 90°	0	3.9	0	10.0
	155.0 Northern Hemisphere	100.0	5.9	4.1
	206.2 Southern Hemisphere	48.7	8.1	1.9
	361.2 Whole	148.7	7.1	2.9

From the above table it will be noted that the sea-area gradually expands south of 70° N.L. until, between 50° and 60° S.L., it rises to 99%.

The Kwantung Leased Territory is situated, as already stated, between 38° 42″ N.L. to 39° 28″ N.L. The San Francisco Bay and other equally well-known salt fields depending on evaporation by the sun along the coasts of the Mediterranean Sea lie in the neighbourhoods of 40° N.L.

Next, the dimensions of three oceans, etc., may be tabulated under:—

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Loading Salt into Junks

Table XII.

	Average depth metre	Area sq. kilometre	Dimensions cub. kilometre
Atlantic Ocean	3,858	81,657,800	314,821,680
Indian Ocean	3,929	73,441,760	288,527,610
Pacific Ocean ...	4,027	165,715,400	678,837,160
Others	1,180	40,104,010	47,759,300
Average depth	3,681	—	—
Total		361,279,170	1,329,945,870
Japan Sea	737 fathoms	1,343,580	1,567,040
East China Sea	98	1,249,000	

The sea-water contains 3.5% of brine, and it is estimated that the total amount of brine contained in the whole of sea water may cover the entire sea-bed in a layer of about 61 metres in thickness.

This brine is left when the water in the sea-water has been evaporated, and more than 77% consists of sodium chloride or common salt. In addition, more than twenty kinds of minerals are found either in original form or in compounds. Such as may be taken into reckoning are as under:—

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The percentages of soda, potassium, lime, and magnesium salts are found particularly high. This may be put down to the congelation of those salts over the surface when the earth' crust was under formacion at the beginning, and also the fact that all of them were highly soluble.

The contents of the sea-water, as analyzed by different specialists, may be tabulated under :—

Analyzer	Mediterranean Sea (?) grammes	English Channel Figuier grammes	Atlantic Ocean Murray grammes	North Sea Back grammes	Percentage in 1,000 grammes Dittmar grammes
Sodium chloride	29.424	25.704	25.180	23.580	77.758
Potassium chloride	0.505	0.091	—	1.010	—
Magnesia chloride	3.214	2.905	2.490	2.770	10.878
Lime bromide	6.080	—	—	—	—
Sodium bromide	0.556	0.103	—	—	—
Magnesia bromide	—	0.030	—	—	0.217
Magnesia sulphate	2.477	2.462	1.750	1.990	4.737
Sulphate of lime	1.357	1.210	1.600	1.110	3.600
Sodium sulphate	—	—	0.250	—	2.465
Carbonate of lime	0.114	0.132	—	—	0.345
Magnesia Carbonate	—	—	—	—	—
Ferrous oxide	0	—	—	—	—
Silicate of sodium	—	0.017	—	—	—
Total	43.735	32.657	31.140	30.460	100.000

How all these salts came to be found in the sea-water will make a most interesting question, which seems, however, extremely difficult of solution.

The origin of salts in the sea water may be divided into three stages. The first theory is that it is a gradual accumulation of what salt was carried in a small quantity down the rivers into the sea. Next, came the second theory that the presence of salt in the sea-water originated in the primitive formation of the sea. Recently, a blending of both the above theories has been gaining in influence.

a) First Theory.

The rainfall penetrates the earth's surface, and it feeds the rivers, brooks, etc. being gathered finally into the sea. The sea water evaporates constantly and the rain is gathered into the sea, the same process being repeated by rotation. With the repetition, the brine becomes more concentrated, and has made the sea-water what it now is.

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M. Laborde, (?) the chemist, refers to the sea water as "washing water flowing out of the workshops of Nature."

About two hundred years ago, Mr. Halley, in calculating the age of the sea, worked on the hypothesis that the oceans in primeval ages consisted of fresh water, and tried to figure out the aggregate amount of natrium, a saline constituent contained in the sea water, and the average amount of natrium carried into the sea annually. This is also in support of the First Theory.

b The Second Theory.

In the Palæozoic Period, while the earth, after undergoing changes from a gaseous body, was in process of formation, the vapour in the atmosphere got congealed, while at the same time the earth got contracted by the radiation of its heat, causing protuberances and cavities on the earth's surface. In these cavities, the seas of the primary stage were formed. There could be no brine in the vapour congealed. But, the surfaces of the cavities, the same as those of the other parts of the earth's crust, had a list of soluables, which are inferred to have been the origin of the present saline.

Some over a hundred odd years ago, Mr. Otto stated:—

It is wrong to infer that the sea water was fresh water in the primeval ages. Fact explains it.

For instance, where on earth could many marine products (both animal and vegetable) that could not live in fresh water live? Would not sea water have its brine gradually condensed and get saturated at the end?

These lead us to believe in the Second Theory.

In order to support the First Theory, the existence of salt lakes which have no outlet is pointed out.

However, such an argument scarcely seems to hold water. The constituents of the salines in the sea-water and in the salt lakes are different. Sea-water contains the largest amount of edible salt; but in the Dead Sea, bittern (or magnesia chloride) is found most conspicuously in the water, that is, to the amount of 65%. In lakes in Egypt, Asia Minor, etc., sodium carbonate contained in the water is often found to treble the amount of salt. In addition, there is no tendency even of the salt percentages in the water of salt lakes coming near one another.

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If the relation between the river water and the sea-water could be explained away on the above line of argument, there might be discerned, numerically some connection between the chief constituents of both, but their percentages point contrariwise and are as under :—

	Carbonates	Sulphates	Nitrates
River water	80.0	13.0	7.0
Sea water	0.2	18.0	89.0

c) The Third Theory.

Being a blend of the First and Second Theories, the Third Theory says that the saline in the sea-water comprises what existed on the sea bed from the primeval ages, together with what has been absorbed by the river water subsequently.

M. Lefebore, of France, Dr. Yokoyama, Mr. Kajiyama (on the faculty of the Marine Products Institute, Tokyo) Dr. Machida, etc., all endorse the Blend Theory in their works and essays. This same theory is recruiting advocates recently.

Carrying out salt out of Salt Depot (View 1)

The saline in the sea-water will be left infinitely, unless, through some awful catastrophe, it gets crystallized, turns to an amorphous mass, or becomes gasified.

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Constituents of Kwantung Sea-water.

The constituents of the sea water in the Kwantung coasts, together with their quantities, are as follows :—

Note :—Even in the coast water about Pitsewo, the data do not come up to the general average of the world, much to our regret. Shuangtaowan near Ryojun, Port Arthur gives the finest showing. This may have some effect on the salt field returns at the two places.

The undermentioned table, on the whole, compares fairly with Table XIII.

Table XIV.

As analysed by S. M. R. Co. Central Laboratory.

	Shuangtaowan	Pitsewo	Pitsewo	Dairen Bay	Hsingmen Hsia	Chuchou Yaklo
Total fixed matter	36·69	35·27	27·42	34·49	29·78	32·06
Sodium chloride	26·24	27·72	19·85	24·01	22·43	21·92
Potassium chloride	1·89	1·15	1·88	2·03	1·61	4·43
Magnesia chloride	—	—	1·71	3·05	—	1·35
						chloride of lime
Magnesia sulphate	1·56	2·32	0·21	2·03	1·94	1·61
Sulphate of lime	1·65	1·32	2·61	1·33	1·54	3·14
Sodium bromide	0·0435	0·0329	0·0029	—	0·0435	0·0510
Sodium sulphate	0·9	0·51	—	—	3·19	—
Ferric oxide	0·027	0·388	0·012	—	0·039	—
Date of analysis	July 1910	June, 1910	June, 1910	March, 1918	July 1910	October, 1910

The above figures indicate the contents in grammes in 1 litre of sea water.

The brine percentage of sea water varies not only according to places, but also to the depths. In the Pacific Ocean, at 3·5 metres deep, the percentage is 3·47%; but, at the depth of 140 metres, it decreases to 3·52%. In the Atlantic Ocean, the data are 3·5548-3·5593% near the surface, and in deeper parts, 3·5348-3·5806%. With one exception, the figures come down as it goes deeper down.

Some specialists say that the difference between the quantities of brine in the sea-water on the surface and directly underneath practically vanishes as it reaches from 400 to 500 metres deep. Down to the depth of 2,000 metres, a trifling decrease in the percentage is noted, but further below the case is reversed, a slight increase being observed, and then further down the percentages appear uniform between 3·4 and 3·5%.

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It can hardly be said that these conditions are universal. Things seem, however, to differ in the border seas.

Carrying out salt out of Salt Depot (View 2.)

For instance, in the Formosan Straits, there is no difference in the water from surface to bottom. Nearer Kyushu Island, at 31° 44″ N. L. and 128° 36″ E. L., the percentage is 3.45% on the surface, 3.43% at 50 metres deep, 3.45% at 100-200 metres deep, and 3.403% at 400 metres deep.

In the observation of the saline, as above mentioned, chemical experiments were conducted.

The following gives the specific gravity of some of the constituents:—

Sodium chloride	1.023
Magnesium chloride	1.0027
Magnesium sulphate	1.0014
Sulphate of lime	1.0009
Potassium sulphate, Carbonate of lime, Magnesium bromide	1.0007

It is natural that sea water should be slightly heavier than fresh water. This indicates that, by weighing sea-water, how much saline is contained may be found.

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This is confirmed by the under mentioned table. –

Table XV.

Specific gravity indicated.

Temperature							
0°	1.79	6.00	11.25	16.52	18.62	20.72	21.77
5°	1.60	6.02	11.18	16.33	18.39	20.45	21.48
10°	1.62	5.67	10.74	15.81	17.84	19.87	20.89
15°	1.00	5.00	10.00	15.00	17.00	19.00	20.00
20°	0.05	4.04	8.25	13.20	15.88	17.86	18.84
25°	—	2.83	7.73	12.62	14.57	16.51	17.51
30°	—	1.43	6.28	11.13	13.07	15.01	16.02
Saline %	2.32	7.52	14.03	20.55	23.18	25.80	27.11
Difference in Saline per 1.00 at 15°	1.30	1.30	1.31	1.31	1.31	1.31	1.31
Temperature							
0°	22.82	23.87	24.93	25.98	27.03	28.08	29.14
5°	22.52	23.55	24.58	25.61	26.64	27.67	28.70
10°	21.90	22.91	23.93	24.94	25.95	26.96	27.98
15°	21.00	22.00	23.00	24.00	25.00	26.00	27.00
20°	19.83	20.80	21.81	22.80	23.79	24.78	25.77
25°	18.49	19.46	20.44	21.42	22.40	23.38	24.36
30°	16.95	17.92	18.89	19.86	20.83	21.80	22.77
Saline %	28.42	29.72	31.03	32.34	33.65	34.96	36.26
Difference in Saline per 1.00 at 15°	1.30	1.31	1.31	1.31	1.31	1.30	—

In the above table, 1.79 of specific gravity indicated, for instance, indicates 1.0179.

Thus, what percentage of saline there is in sea water may be learned by its specific gravity.

For the observation of specific gravity, a hydrometer will answer the purpose. This is why the hydrometer plays an important role in salt industry.

In the salt grounds, Dr. Baume's hydrometer, specially designed to simplify the observing process, is most popular. It is a floater, much the same as an ordinary hydrometer, except that it is graduated differently.

How Dr. Baume's hydrometer is made may be roughly outlined.

Take a vertical glass tube with a bulb at the bottom. In this bulb is put a certain amount of tiny balls of lead, and then, the tube is closed air-tight. It is properly weighted so that it may stand erect in the water. Now the tube is stood in the water so as to get its top at about on the level with the water surface.

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The water level is marked as 0°. Next, a saline solution consisting of 85 of water and 15 of salt, of 1.1138 in specific gravity. Float the tube in this solution, and mark the water level as 15°. Then take the same distance between 0° and 15° below 0° and mark it as 15°. Next, graduate the intermediate points.

The following table will be of interest:—

Table XVI.

	Baumé degree	Brine % in sea-water	Salt % to be applied to water	Specific gravity
1	1°	1	1.0	1.0068
2	2°	2	2.0	1.0138
3	3°	3	3.1	1.0208
4	4°	4	4.2	1.0280
5	5°	5	5.3	1.0353
6	6°	6	6.4	1.0426
7	7°	7	7.5	1.0501
8	8°	8	8.7	1.0576
9	9°	9	9.9	1.0653
10	10°	10	11.1	1.0731
11	11°	11	12.4	1.0810
12	12°	12	13.6	1.0890
13	13°	13	14.9	1.0972
14	14°	14	16.1	1.1054
15	15°	15	17.7	1.1138
16	16°	16	20.5	1.1224
17	17°	18	22.0	1.1810
18	18°	19	23.5	1.1398
19	19°	20	25.0	1.1487
20	20°	21	26.6	1.1578
21	21	22	28.2	1.1670
22	22°	24	29.9	1.1703
23	23°	25	3.33	1.1858
24	24°	26	3.49	1.1955
25	25°	27	—	1.2053
26	26°	—	—	1.2153
27	27°	—	—	1.2254
28	28°	—	—	1.2357
29	29°	—	—	1.2462
30	30°	—	—	1.2569
31	31°	—	—	1.2677
32	32°	—	—	1.2788
33	33°	—	—	1.2901
34	34°	—	—	1.3015
35	35°	—	—	1.3131

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Remarks: Of the above table both Baume degree and specific gravity columns have been obtained from Gerlach's table; the brine % from "Salt Industry in France," a translation of which into Japanese has been published by the Revenue Bureau of the Ministry of Finance, Tokyo; and the salt % from No. 2, Volume V., the Report of Marine Products Institute, the Ministry of Agriculture & Commerce. It is probable that the salt applied, as indicated in the salt % column, contained a higher percentage of water and insolubles than usual.

Table XVII.

The above table will be a decided help to finding the saline quantity contained in sea water from the specific gravity.

Now, let us give a comparative table of specific gravity between sea waters in different places and on the Kwantung coasts.

The data for Kwantung Leased Territory have been obtained from the S. M. R. Co. Central Laboratory.

	Specific gravity		Specific gravity
Pacific Ocean	1.027	Takao	1.010
Atlantic Ocean	1.028	Tsingtao	3.1 by Baume
Indian Ocean	1.026	Chefoo	20-30 „
Mediterranean Sea	1.020	Kwantung Leased Territory:	
Japan Sea:		Shantaowan	1.025
Southern part	10.255	Pulantien	1.026
Northern part	10.253	Dairen	1.019
East China Sea	1.025	Hoshigaura	1.021
Formosa:		Huao-Yaokou (Chinchou) ...	1.020
Hoteishi	1.027	Dairen Bay (October)	1.025
Hokutoseki	1.025	„ (March)	1.028
Taman	1.030		

It is probable that the difference in specific gravity is owing chiefly to the tidal current and meteorological conditions.

If the tide belongs to the Black Current, and if the weather conditions are suited to the condensation of sea-water, as already observed, the specific gravity is bound to be high.

In the Kwantung Leased Territory, although the meteorological conditions are favourable, little benefit of the warm sea-current is perhaps shared.

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There is only a branch of the Tsushima Current running northward along the western coast of Chosen Peninsula, but, as it is stopped by the eastern coasts of Liaotung Peninsula, the Kwantung Leased Territory gets only some spent splashes.

However, it is nothing to be envied to be exposed to the Ocean like the three Provinces of Rikuzen, Rikuchu, and Mutsu (in the northeastern part of Main Island of Japan) the shores of which are washed by both cold and warm currents. For, it is liable to affect the weather unfavourably.

Working tread mill at Salt Field.

It may be reminded that the data concerning specific gravity are not at all constant, but are subject to a range of variation from the seasonal and weather changes.

It tends to rise in dry weather fanned by a dry wind; the reverse will be the case when there is more rainfall. The changes from the rainfall will be felt most at places near a river mouth, so a coast line having river mouths ought to be avoided.

According to a rough estimate of Dr. Brandt, from the water-volume discharged by the Rhine, the grand total water flow of all the rivers in the world is

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19,600,800,000,000 cubic metres a year, from which the amount of salt to be sent into the sea may be computed.

The following is a table for specific gravity of sea-water in the likely sites for salt fields about Hsiao-Yen-hsiang (or near the mouth of the Teng Shako) in the districts under the Pulantien Branch Civil Administration —

Data collected by Dairen Branch, the Oriental Colonization Co.

Observed on October 30, 1921.

Numerical order of observation	Baume specific gravity	
	Surface	Underneath surface
1	3.2	3.8
2-4	3.1	3.8
5	3.2	3.9
6	3.2	3.9
7	3.2	3.8
8	3.2	3.7
9	3.2	3.7
10	3.2	3.8
11	3.2	3.8
12-14	3.2	3.7
15	3.2	3.7
16-17	3.2	3.7
18	3.1	3.5
19	3.1	3.5
20-22	3.0	3.5
23	3.0	3.5
24-26	2.8	3.0
27	2.3	2.6
28	2.3	2.6
29-30	2.0	2.3
31-32	1.8	2.0
33	1.5	1.8
34	1.2	1.4
35	1.0	1.2
36	1.0	1.1
37	0.5	0.7
38	0.2	0.3
39	0.1	0.1
40 41	2	0

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Observed on October 7, 1921.

Numerical order of observations	Baume specific gravity	
	Surface	Underneath surface
1-3	4.0	4.3
4	4.0	4.2
5	4.0	4.0
6	4.0	4.0
7-11	3.8	4.0
12	3.8	4.0
13-15	3.8	4.0
16	3.8	4.0
17-19	3.8	4.0
20-22	3.8	4.0
23-24	4.0	4.1
25	3.8	4.0
26	3.8	4.0
27	3.8	4.0
28	3.8	4.0
29	3.8	4.0
30	3.5	3.8
31	3.5	3.8
32-33	3.2	3.0
34	2.8	2.8
35	2.0	2.0
36	1.0	1.0
37	1.0	1.0
38-40	0	0

The above observations were made, beginning with the mouth of the recess up to the mouth of the Teng-Shaho.

c) Tide.

For the introduction of sea-water into salt fields, nature must be depended upon wholly or at least for most part. Especially where evaporation by the sun obtains, the more labour is saved, the better will its characteristic advantage be set off. On this account, in the introduction of sea-water and also the outflow of the brine, the co-operation of nature is to be heartily desired.

By the attraction of both sun and moon, the tide rises and falls twice a day, and the difference between the high and low tide levels is what makes a natural factor that counts.

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As the moon is so much nearer the earth, its power of attraction is 2 1/5 times as strong as the sun's. As the relative positions of the moon and the sun to the earth change constantly, their distances to the earth change correspondingly, causing a variation in the power of attraction, putting on the tide a complex phase.

Besides, the tidal conditions change also according to the depth of water, the shape of the sea-area, and the difference in latitudes. Not only the variation mentioned in Table XX occurs, but changes are observed even at the same point.

For instance, speaking of the earth's relation to the moon, the tide rises and falls once every 12 h. 25 m. 30 s., in addition to another regular rise and fall once every 25 82 hours, because of the moon's taking 27·32 days to revolve round the earth once. There are other tides that complete one rise and fall every half month, one month, six months, and, in some cases, as long as eighteen years.

These different tidal conditions react on one another, producing a perfect maze of complications.

The tide forms waves of great length extending each from hundreds of miles to thousands of miles. In speed of progress and height, the depth of water tells. The deeper it is, the higher will be the speed. The reverse holds true. As the water grows shallower, the speed will decrease, whilst the height will be greater and the wave length shorter.

Theoretically speaking, the speed of the wave is proportionate to the square root of the product of the depth of water and the acceleration of gravity, whilst its height is inversely proportionate to the fourth root of the depth of water. What is called the height of the wave means the difference between the high and low tide levels.

As already stated, the height of the wave increases according as the water grows shallower, and also according as the sea-area lessens in width, because of the concentration of the motion power of the wave.

The Bay of Fundy on the eastern coast of Canada is famous for 70 ft. of the tidal altitude, the highest in the world. Next come 53 ft. of Bristol Channel at the mouth of the River Severn, and 36 ft. of the Bay of St. Michel on the northern coast of France.

The natural features that go to increase the tidal altitude include the formation of the bay like a funnel, growing narrower and shallower as it goes farther inland.

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Now Liaotung Peninsula projects from what might be regarded as near the farthest end of such a bay, and it is not at all to be wondered at that the tidal altitude should be found here only about fairly high.

To put in a word about the tide in the Yellow Sea and the Gulf of Pechili, which surround the Kwantung Leased Territory, it starts way down south, and passes through the Loochoos northward. The tide flows and ebbs twice a day with a measure of regularity.

In the Yellow Sea, the depth of water is generally not great, and points deeper than 50 fathoms are said to be but a few. It is bounded on the east by Chosen and the Kwantung Leased Territory, being hemmed in by North China including Shantung Promontory on the west, thereby losing in the width of the sea. This causes a corresponding loss in speed, whilst the gain in tidal altitude becomes larger.

On the Korean coasts especially about Chemulpo, the altitude rises to 33 ft., the highest in the neighouring seas of Japan. It is owing to the tide in the south of the Yellow Sea rushing northeastward in the direction of Chosen Peninsula and striking its western coasts.

The tidal altitude for the North China coasts on the other side of the Sea is nothing remarkable.

There is one current of tide that, on reaching Shantung Promontory, takes a turn to the west and the other that follows a sinuous course and gets into the Gulf of Pechili.

The tide gets spent inforce at each turn it takes, and by the time it touches the Kwantung coasts, the tidal altitude is not so great as in the Chosen coasts.

For the above reason, even in the Kwantung Leased Territory, as one nears towards the Gulf of Pechili along the coasts from Pitsuwo in the northeast, the tidal altitude tends to fall off, although a distinct difference is noticed in a recess than on the open coast.

As may be seen from the following table, there is about three feet's difference between the tidal altitude at Dairen on the Yellow Sea and Pulantien on the Gulf of Pechili, whilst a two feet's difference is observed between the Pulantien Bay and the Wutao (Five Islands) Group situated in the northwestern coast of the Leased Territory. Thus, the differences in tidal altitude are due in a large measure to the shape of the coast line and depth of water.

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The following table gives the hours of day and tidal altitudes at the principal points in Japan, Chosen, and China, inclusive of the Kwantung Leased Territory :—

	o'clock	Tidal altitude
Nemuro	4.09	6 ft.
Muroran	3.46	6
Miyako	4.19	5
Sunagawa	5.50	7
Yokohama	5.45	7
Yokkaichi	6.23	9
Osaka	7.34	6
Kobe	7.34	6
Awashima	11.39	13
Kure (Naval Station) ...	9.52	13
Shimonoseki	9.25	9
Kagoshima	7.22	10
Wakatsu	9.25	18
Nagasaki	8.11	11
Sasebo	8.44	11
Takeshiki (Tsushima) ...	9.17	8
Matsuru	2.32	1
Tsuruga	2.28	1
Niigata	3.17	1
Omonato	4.03	3
Hakodate	4.10	4
Otaru	4.12	1
Ohtoman (Karafuto) ...	3.54	5
Vladivostok	2.30	1
Wonsan (Chosen)	3.17	2
Fusan	8.17	4
Chinkai Bay	8.23	7
Mokpo	2.12	14
Kunsan	3.57	23
Chemulpo	5.03	31
Tetto (near Dairen)	9.23	22
Yongampho	10.41	18
Yingkou	5.00	12
Taku	3.30	12
Weihaiwei	11.20	8
Tsingtao	6.00	12
Shanghai	1.30	10
Hongkong	9.00	9
Keelung (Formosa)	9.46	4
Mako	11.52	10
Takao	8.19	4
Dairen	10.38	11½
Ryojun (Port Arthur) ...	11.07	9½
Yangtouwan	11.40	7
Yingchengtzu Bay	0.46	7½
Pulantien Bay	1.37	8½
Hsi-Changtao (of the Wutao Group)	1.48	6½

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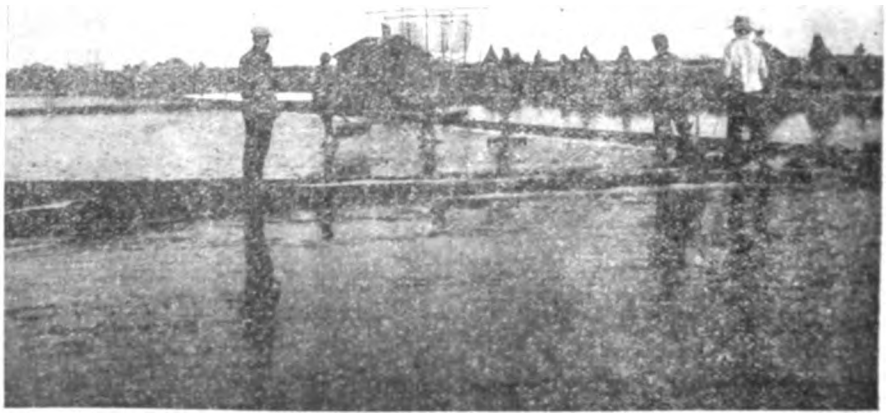
As stated above, a high tidal altitude is a precious asset for a salt field.

The coasts of the Kwantung Leased Territory are as above stated. Now, the tidal altitude is of course beyond human control. If the salt field is of extensive area and also sharp in gradient, a high tidal altitude is required. And, where the tidal altitude is not high enough, wind mills and even tread mills may be brought into use as auxiliary instruments. A wind mill will be found very handy where meagre natural advantage has to be made up for with human contrivance. It will answer the purpose of getting in sea-water with scarcely any labour. Still a new wind mill will cost some ¥800, and even allowing one mill for every 90,000 *tsubo* of salt field, the items of outlay will tell.

Among the salt fields now existing in the Kwantung Leased Territory, those where wind mills are utilized most are at Pitsuwo and next thereto come others in the district under the Pulantien Branch Civil Administration. There is not a wind mill in use at Shuantaowan (near Port Arthur).



At Salt Field.

Of the prospective sites for salt fields, those about Pitsuwo, Sankuanmiao, and Hou-Santaowan may stand in need. But none will be wanted about the mouth of the Teng-Shabo.

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As to the data in the above table concerning Pitsiwo and the Teng Shaho, they have been obtained from the results of minute surveys and investigations conducted by the Oriental Development Co.

Although a full tidal altitude is desirable, no excess in this respect can be valued. It will suffice at a salt field to get the sea-water at flood tide to run up the ditches into the reservoir or the evaporation bed. Any excess in this point will go to increase the cost of laying out the salt field.

Chinese Potters' Yard.

There have been many salt grounds laid out by the Government General of Chosen, which required from Y1,500 to Y2,[illegible] per 3,[illegible] *tsubo*, being three or four times the cost for those in the Kwantung Leased Territory. Such an outlay has been necessary presumably in order to provide against the excess tidal altitude or fixed.

In the Kwantung Leased Territory, there are indeed many salt fields that need supplementing, but none endowed with an excess altitude.

The physiographical factors are roughly as stated above. They are all natural phenomena which admit of no human interference and are also fixed.

Therefore, the assets of the Kwantung Leased Territory have been fairly appraised or fixed.

Only, in the manufacture of salt by natural evaporation, the salt ground gets steadily improved as it is used year after year and will give an increasing yield, quite unlike the soil which has to be well manured, no matter how fertile, to ensure an abundant crop.

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B. Human Factors.

Next by "human factors" are meant relations to labour, means of communications, etc.

However, at the present stage of salt manufacture by evaporation, it is left mostly to nature from the admission of sea water into the salt field to the crystallization of salt. Thus, what labour operations are required are quite simple, compared with other productive enterprises. Therefore, what may be included among the human factors are only secondary, nature herself holding the key to success.

A few of the human factors may be entered into.

1. Labour.

Allowing for local conditions, one Chinese coolie may tend to 6,000 *tsubo* of salt field. On this basis of calculation, 500 coolies will do for 3,000,000 *tsubo* of salt field. Still the labour charges constitute the main item of expense, and on this account, low labour wages are essential.

In the Kwantung Leased Territory, labour for the salt fields is furnished by Chinese exclusively, and they are called "salt coolies." If there is any shortage in labour, the same may be easily imported. The monthly wages are about ¥10 or so, which, in itself, speaks of their low standard of living.

It is true that there is but a little room left for human ingenuity for the improvement of a salt field, but in this small room lies the secret of success, for nature must be intelligently treated, but cannot be left to suit her own fancy.

For instance, at the height of the season, the salt crop is harvested daily, so very differently from the rice crop which is, in Japan, ordinarily harvested once a year.

It will require a measure of good sense to adapt matters to the ever changing weather conditions to increase the outputs. On this score sensible and faithful services of the salt coolies must be depended upon.

So far, in the Kwantung Leased Territory, one coolie per 3,000 *tsubo* has been employed under Japanese overseers.

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2. Means of Communications.

Means of communications may be included, in a sense, among the natural factors, which, by the way, have been closely connected with salt production in the present article.

For convenience sake, the devices for transportation are dealt with separately.

As salt fields are laid out where the beach slopes gently, unfit for the mooring of vessels, marine transport facility is no common one to salt fields. Then, as the natural assets go to decide the sites for new salt fields, land transport facility, too, is not to be always depended upon. In Chosen, about Tsingtao, and in Formosa also, salt gardens are located in rather out of the-way parts. But at most salt fields, the carriage of salt exceeds the producing cost itself.

In the Leased Territory, the natural factors are more than satisfactory; but not little is left to be desired in respect to the human factors.

The export of Kwantung salt is made practically wholly by sea.

Salt may be loaded into ships either off the salt fields or at the salt depots. The former obtains in a small part at Shuangtaowan, Wutao, and Pitsuwo, and in the other cases, the work of loading into vessel is conducted at the salt depots, as may be noted under:—

Table XX.

According to returns gathered by the Industrial Office, the Kwantung Government:

Loaded at Salt Field.

At	All charges for carrying from salt ground and loading into vessel
Shuangtaowan	12.6 sen per 100 *kin.*
Wutao	14.8 „ „
Pitsuwo	14.9 „ „

Loaded at Salt Depots.

	All charges from salt depots to vessel
Ta-piaoshantao	27.7 sen per 100 *kin.*
Hsi-Chuantao	25.8 „ „
Ryojun (Port Arthur)	21.4 „ „
Pochitao	27.9 „ „

The nett producing cost of salt in the Leased Territory being only 8.19 sen per 100 *kin* (according to p. 30 "Salt Industry in Kiaochou Bay and Kwantung

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Leased Territory, published by the Kwantung Government), the advantages of the natural evaporation process are thus very seriously discounted.

The same will perhaps hold true also with new fields that will be laid out in future in the Leased Territory.

The Kwantung Government officials say that the need of loading salt at the salt depots, instead of direct at the salt fields, exists partly because, owing to the export to Japan under contract with the Japanese Government, consignments must be shipped out even in winter, and partly because, at the best, many junks can not be accommodated at any of the salt beaches. This defect admits of remedy by improving the salt depot facilities and the development of carriage traffic. Pending this, loading at the salt depots must be kept on together with loading at the salt fields.

At all events, the same subject calls for further study.

Only, at Teng-Shaho, the Oriental Development Co. has found, by means of surveys conducted on its own account, that there is at an adjoining point a sufficient water for the admission of junks.

[illegible] Engineering (University) College, Port Arthur.

With the drawback in the shape of the heavy cost of carrying salt to ship, salt made by evaporation still retains its place as being the cheapest-produced.

As stated at great length, the natural advantages of the Leased Territory as salt centre indeed add another important enterprise to the list of indigenous industries.

It is to be hoped that the Leased Territory, which has been the scene of the two historic siege operations, will now be turned, with the cessation of war on earth, into one of the great salt producing belts, furnishing "salt of the earth"

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literally and also in a metaphorical and higher sense, and the Oriental civilization, which has got blended here with the Occidental civilization, will progress like the tide, clarifying, enlightening, and beautifying all who may be baptized thereby.

The above, in short, has given only the natural and other facilities for the production of salt in the Kwantung Leased Territory. The conclusion reached by the above is that the Leased Territory is superbly fitted by nature and otherwise for salt manufacture.

In order to launch any manufacturing enterprise, the possibilities for the market for the outputs must be studied with equal thoroughness as the advantages for production.

Particularly, salt has no substitute; nor has it any other use than strictly its own.

Since Kwantung salt is available for supply to Japan, which keeps salt under Government monopoly, the salt industry in the Leased Territory is inseparably associated with the supply and demand situation in Japan.

3. Supply and Demand Situation in Japan.

In studying the possibilities for salt manufacture, the first thing to be considered is producing power; the next thing is producing cost; and thirdly comes quality.

The total salt outputs of Japan are no more than 1,000,000,000 *kin* a year, as indicated in the annual reports of the Monopoly Bureau of the Ministry of Finance, Tokyo.

It has been noticed recently that, in respect of the number of people engaged in the industry and also in point of the area for salt fields, a decreasing tendency has set in.

This industry may have got fixed into a traditional one handed down from generation to generation, but little improvement has been applied.

Whilst the supply remained almost fixed in quantity, the national demand, according to reliable data since the introduction of salt monopoly, rose from 1,000,000,000 *kin* to 1,100,000,000 *kin* eleven years ago, the figure for 1911

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being 1,142,000,000 *kin*. Recently, a sudden increase has been observed, and the returns for 1917 reached 1,369,000,000 *kin*.

At present, the Monopoly Bureau authorities place their estimate at about 1,500,000,000 *kin*.

Thus, some 500,000,000 *kin*, the shortage in supply, has to be made up with imports.

According to the Superintendent of the Salt & Camphor Section of the Monopoly Bureau, the demand expanded during the war time is not expected to decrease, but will, on the contrary, gradually increase with the growth of population and the development of industry.

The following is the estimated demands for salt, as prepared by the Monopoly Bureau :—

Table XXI.

	For			
	General consumpt on	Industrial uses	Fishery uses	Total
	1,000 *kin*	1,000 *kin*	1,000 *kin*	1,000 *kin*
1913	1,191,280	186,000	160,500	1,537,780
1914	1,208,541	193,750	162,400	1,564,691
1915	1,226,052	201,500	164,300	1,591,852
1916	1,243,819	209,250	166,200	1,619,269
1917	1 261,843	217,000	168,100	1,646,943
1918	1,280,126	224,750	170,000	1,674,873
1919	1,298,674	232,500	171,900	1,703,073

The Monopoly Bureau feels that, in addition to the above, 200,000,000 *kin* or 300,000,000 *kin* should be held in stock.

What is the producing cost per 100 *kin* is not easy to obtain. But the authorities report that, for putting out 100 *kin* of salt by boiling brine of 15° Be., 127.62 *kin* of coal is required. In addition, dear labour wages in Japan must be reckoned with. So the cost of production in Japan must be pretty stiff. The figure for 1917 was ¥1.14 per 100 *kin*; for 1918, ¥1.87; and for 1919, ¥2.18. The Marine Products Institute of the Ministry of Agriculture & Commerce, in a publication dated March, 1919, places the producing cost for 3rd grade salt at ¥1.81, per 100 *kin*.

With the increase of the producing cost in Japan, the Government purchasing prices were also raised, but the former advanced too fast for the latter to keep

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pace with, and in 1918-1919, representations and petitions for the raise of the Government purchasing prices were filed one after another.

The Government, with an eye to its social policy, fought shy of raising the selling prices correspondingly, and whilst the Salt Monopoly business alone used to put in the national coffer the sum of ¥10,000,000 per annum at the start, the amount fell off to ¥7,500,000 as result of natural decrease in receipts, and further to only ¥150,000 in 1919, both according to the Settlement of Accounts.

Next, as to quality, tables of analyses have been published from time to time. Of Japan salt, the 5th grade salt (the lowest having not less than 70% of sodium chloride takes up the major portion, and 1st grade salt (containing not less than 90%) and 2nd grade salt (not less than 85%) are only in small request. The rates of production of the different grades of salt are being published by the authorities annually, but no indication of increase of the higher grade salt has been noted. It is possible that, home salt, being largely turned out by boiling down sea-water, the crystal is uniformly loose, being of a kindred colour, and the consumers rather choose the cheaper grades, since 5% or 10% less in salt having 70-80% of sodium chloride will not be easily perceived by the palate.

In 1918, the greatest salt centre in the Inland Sea, Japan, was visited with storms at short intervals during the salt season. The result was an unusually poor crop for that year, the total production amounting to only 670,000,000 *kin*. Cries were heard on all hands against short supply.

The Central Government was fully taken up with the elaboration of a fundamental salt policy and organized the Extraordinary Financial and Economic Investigation Commission in October, 1919, referring thereto the salt question among other issues of great moment.

What the Government submitted on this question may be extracted in part :—

Since the outbreak of the War, with the remarkable inflation of the economic Japan, the demand for salt has increased by leaps and by bounds. Salt for industrial and fishery uses, not to mention what is for daily household use, has been in increasing demand, while the crop has continued indifferent from 1915 till 1918, the harvest in the last mentioned year being the poorest ever known. The Government has taken to the import of salt made by natural evaporation from Formosa,

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Kwantung Leased Territory, Annam, Spain, Egypt, China, etc., but still the supply has fallen short of the requirements. The inflated demand, on the other hand, has shown no sign of decrease, and the annual demand may be estimated at some 1,500,000,000 *kin*.

Some 600,000,000-700,000,000 *kin* of salt must be imported. The idea of filling the gap with an increased output of salt in Japan is scarcely practicable from an economic consideration. For, the higher labour scale at home will compel the authorities to raise the sales prices. If the prices be to be kept low, the National Treasury would have to be prepared to put up with a loss.

Next, if a necessary source of supply be to be looked from outside Japan, the dependability of supply will become uncertain whenever some serious unlooked for event crops up.

Under these circumstances, it is considered as a matter of national importance to formulate some fundamental policy, by which the salt supply may be made always dependable and obtainable at as low a price as possible, to the end of stabilizing the people's living and contributing to the growth of economic activities.

To hear such a wailing cry from the lips of the Prime Minister at so late a date as that was certainly an eye-opener, although the salt situation of Japan had been culpably overlooked.

Since, the subject of salt supply has enlisted a general interest, and those best versed in the prevailing conditions at the chief salt centres stated how things stood, together with their views, before the Special Committee of the Financial and Economic Commission with Viscount T. Mayeda for Chairman.

Many members of the Special Commission personally visited various salt centres in Japan, and a concensus of opinion is in favour of salt production by natural evaporation. Only, the same objection that some unforeseen event might interrupt the import of salt from outside Japan remains in the way.

At present, the most important food-stuff, rice, itself has ceased to be self-supplying; then, for cotton and sugar, which must be counted also among the first necessaries, a larger portion of supply is being obtained from outside Japan proper.

Still, apart from the question of commercial feasibility, the only article that admits of indigenous production at home is salt.

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An experiment has been conducted at the outlay of ¥360,000 through Dr. Ikeda as regards the method of boiling sea-water direct.

But, after all has been said and done, there will be no resisting stern fact or statistics.

In Japan, such points as depend on salt manufacture by boiling sea-water for sustenance only ought to be allowed to pursue the industry. At least, such should be the guiding principle. For the balance of supply, the improvement and development of salt by natural evaporation should be turned to. Such will be the most sensible line of policy to be established.

By the way, in 1919, those who earned their living from salt manufacture numbered 9,866.

As stated above, at present the national deficit of supply is 500,000,000 *kin*, and for the present fiscal year, too, 20,000,000 *kin* of Weihaiwei salt and 50,000,000 *kin* of Annamese salt must be procured at Yen 14, which is the price for the first grade Kwantung salt. This tendency will be only aggravated, and in less than ten years hence, the shortage to be made up for with imported salt threatens to run up to 10,000,000,000 *kin* a year.

Under such circumstances, Kwantung salt produced in a territory so bounteously endowed in every way by nature for this industry should be said to have a most promising future indeed.

The question is: "Will the Kwantung Leased Territory effectually help to solve the salt shortage question of Japan?

An intelligent answer to this question can be obtained only by studying the producing capacity, producing cost, quality of outputs, etc.

A detailed treatment of each item is not for the present articles, therefore only a hurried review thereof will be made.

There is an almost certain possibility of enlarging the area of salt fields in the Leased Territory, while there is plenty of room left for such enlargement. So, there is said to be a prospect of the total production being raised to 937,260,000 *kin*, according to the estimates prepared by the Kwantung Government.

If what may be termed as the wooden bed system should be adopted, a 30% or larger increase in outputs may be realized.

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Then the cost of production in the Leased Territory is undoubtedly the lowest among the salt fields worked by natural evaporation, and allowing for the possible fluctuations of prices, labour wages, etc., there is at present not a factor that is calculated to tip the scale adversely.

Then, talking of the quality of outputs, in point of the percentage of sodium chloride contained, the fine grade Kwantung salt is pronounced by the specialists of the Monopoly Bureau of the Ministry of Finance to have 84%, and the next grade salt 82%, which place them above the 2nd grade salt in Japan. But, the presence of insoluble matter such as fine particles of dust, etc., which impair the colour no little, is ascribed to the floating mud on the salt ground. This is proved by the installation of a brick or wooden bed to take the place of the natural earth ground. By this installation, a pure white salt is obtainable. It is necessary that, in order to preserve the purity of colour, the salt output should be stored away under cover, instead of being allowed to lie in heaps, exposed to dust, etc.

That every improvement desired is possible in the Leased Territory has already been shown by the experiments carried on by the Oriental Development Co.

The following table of analysis of the outputs, which are, by the way, not only sample salt, but of which 1,000,000 *kin* was procured last year and the annual production from this year on is to be increased to 5,000,000 *kin*, will make plain how the fulfilment of the hopes of the consumers lies within the range of realization.

Table XXII.

	Sample 1	Sample 2	Put out on wooden floor
Water	4.32	3.75	0.89
Insolubles...	0.02	0.07	0.02
Sodium chloride	95.02	93.79	97.93
Sulphate of calcium	0.24	1.20	0.49
Sulphate of magnesium	0.14	0.24	0.26
Magnesium chloride	0.26	0.95	0.41
Calium chloride	trace	slight	trace

Remark: Sample 1 was made on a wooden bed and was washed; Sample 2 was made on the natural earth ground.

The analysis was conducted by Mr. J. Kato, in charge of the Technical Testing in the service of the Central Laboratory of the South Manchuria Railway Company. The date of analysis was February 6, 1922.

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It may be added that salt obtained by natural evaporation approaches in quality to refined salt produced in the West. Only the former takes on the form of granulated crystal. This point has once been brought up by an expert of the Monopoly Bureau of the Ministry of Finance as a drawback of Kwantung salt, which disqualifies it from occupying the first place on the salt list.

As to this phase, some change may be introduced into the manufacturing process to remove or at least minimize the peculiar defect, and besides, the output can be crushed.

(Concluded)

TRADE & INDUSTRY.

DAIREN PRICES IN MARCH, 1922.

With Comparative Data.

Speaking of the prices of staple produce of Manchuria and principal imports at Dairen during the month of March, 1922, the average indices for the staple produce were 164.09, as against 164.26 for the average of the preceding year, being a fall by 17, which was much the same as in the previous month.

Next, as regards the principal imports, the average figure for March was 208, as against 207.25 for the preceding month, being only 0.25 higher, but being a rise by 10.43, compared with 197.57 for March, last year.

Rises and Falls.

To be more particular, the articles which rose or fell in price, may be tabulated under:—

A) Staple Produce:

Those that Rose.

Bean Oil, Kaoliang, Millet, Maize, Sesamum, Wheat flour, Wheat, and Cowhides of all sizes.

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Those that Fell.

Beans (yellow, blue, and white), Bean Cake, Red Beans, Hempseed, and North Manchurian timber.

Stationary.

Salt and Coal.

B) Principal Imports:

Those that Rose.

Cotton yarn, imitation native cloth, grey shirting, jeans, *soy*, and newspaper paper.

Those that Fell.

Cleaned rice of all grades, *sake*, corrugated galvanized iron, foreign nails, and matches.

Stationary.

Grey sheeting, gunny bags, wheat flour, kerosene oil (of Standard Oil Co. and Asiatic Petroleum Co.), and foreign paper.

Comparative Price Indices.

The actual data of comparison between those in March, 1922, February, 1922, and March, 1921, are given under: —

A) Manchurian Staple Produce.

Price Indices.

	March, 1922	February, 1922	March, 1921
Beans (yellow)	140	143	98
(blue)	140	144	92
(white)	135	136	101
Bean Cake	147	158	115
Bean Oil	129	128	75
Small Beans (red)	96	100	72
„ (white)	125	128	89
Kaoliang	155	140	138
Millet	139	132	126
Maize	134	121	146
Hemp-seed	130	137	62
Sesamum	149	143	72
Wheat...	228	224	179
Wheat flour	160	146	125
Salt	250	250	333
North Manchurian Timber	175	200	227

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	March, 1922	February, 1922	March, 1921
Yale Timber	—	230	240
Cowhides (large)	147	128	123
(medium)	135	121	121
(small)	167	150	147
Fushun Coal Lump	235	235	284
Uncrecned	236	230	277
Dust	258	258	287
Average	161 5	164 26	153

B) Principal Imports.

Price Indices.

	March, 1922	February, 1922	March, 1921
Cleaned rice (fine)	218	223	158
(medium)	227	230	164
(indifferent)	216	219	157
Cotton yarn	190	154	165
Native imitation cloth	198	193	158
Grey shirtings	192	190	151
Grey sheeting	190	196	177
Jeans	203	202	158
Gunny bags (blue striped)	110	110	92
(iron striped)	80	80	80
Wheat flour	202	202	144
Refined sugar	161	161	279
Kerosene Oil S. O. Co. N.Y.	210	210	196
" " A. P. Co.	229	229	214
Sake	406	417	322
Corrugated galvanized iron	178	184	243
Foreign nails	218	227	245
Matches	158	165	138
"Soy"	286	281	188
Foreign paper	200	200	274
Newspaper paper	192	165	277
Average	208	207	197

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MANCHURIA ENLIGHTENING SOCIETY.

Whose Organ the "Light of Manchuria" is

What actuates us in our endeavours to open up Manchuria and Mongolia lies in realizing our ultimate ideal in the enlightenment and development of Manchuria and Mongolia. It will not do only to develop the natural and industrial resources, but the ethical and intellectual culture of the inhabitants must also be carefully husbanded and nourished, so that both mind and matter may be developed in harmony.

The Manchuria Enlightening Society raised its first cry in order to fill a sorely felt need. Its primary mission is to investigate and propagate the truths of the development of Manchuria and Mongolia. We shall studiously refrain from misleading the public by disseminating inaccurate or exaggerated reports, but shall steadfastly adhere to the truth or facts only.

It is urgently important that the truths regarding Manchuria and Mongolia should be made known clearly not only to Japan and China, but also to Europe and America. On this account, the establishment of the Manchuria Enlightening Society is bound to have a serious significance of international character.

If happily, through the establishment and activity of this Society, the truths of the development of Manchuria and Mongolia should become topics of world wide interest, it would not be only an honour to those now actively engaged in developing these regions, but also a matter of congratulation to the world at argle.

We might be permitted to add that the ultimate ideal and desire of this Society are to serve as the herald of all enlightening movements in future, thereby opening a new chapter in the annals of the world's civilization.

What is the Society Like.

a) Office.—The office of the Society is in the Municipal Office Building on Central Circle in the city of Dairen.

(b Society's Work.—The works of the Society include the following:—

1. Publication of the organ of the Society, The "Light of Manchuria."

2. Supply of general information through the Socitey and by other means, giving the results of such investigations and researches as may be conducted in the interest of the development of natural, industrial, and other resources in Manchuria, Mongolia, and Eastern Siberia.

3. To act as guide to intending investors in general in all kinds of enterprises in Manchuria, etc., and also to undertake any special investigation or research on application by promoters of all kinds.

4. To offer facility to travellers on inspecting visits to Manchuria, Mongolia, Siberia, Chosen (Korea), China, etc., to the end of importing accurate information and rendering their observations as close to truth as possible.

5. To use all kinds of means in order to propagate the true conditions obtaining in Manchuria, etc., and further to carry on the propacanda work for these regions through the medium of lecture meetings, exhibitions, etc.

6. To compile, publish, sell and distribute books, pamphlets, etc., bearing on Manchuria and Eastern Siberia.

7. To carry on other works necessary for disseminating information on Manchuria, etc., and also for fostering economic enterprises therein.

c) In carrying on the above work, the Society is divided into the following:—

Secretariate,
Research Department,
Publication Department,
Intelligence Department, and
Accounting Department.

d) Any one wishing to join the Society is requested to send in a written application, giving the name and address, accompanied with the

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membership fee for not less than three months paid in advance.

e, The membership fee, entitling the member to a copy of the monthly organ, costs 50 sen (½ yen) per month and ¥6 per annum.

Remittances.

All remittances to the Society may be made most conveniently and safely to Transfer Savings No. 2850, Dairen. No receipts for the same will be issued, but instead the Society's monthly organ will be sent.

Officials.

Baron S. Goto (Mayor of Tokyo), President.

Mr. S. Hayakawa (President, South Manchuria Railway Company), Chairman;

Mr. Y. Aoi (Chairman, Chamber of Commerce, Dairen), Vice-Chairman;

Mr. Y. Matsuoka (Director, South Manchuria Railway Company), Vice-Chairman;

Mr. H. Kasahara, Secretary

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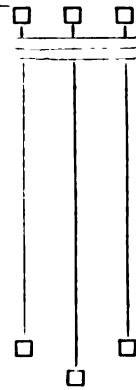

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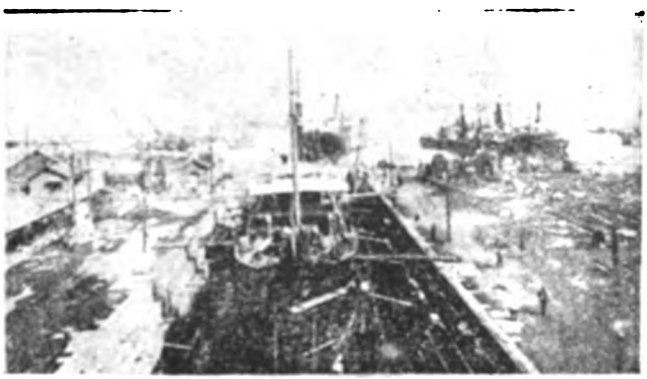

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LIGHT OF MANCHURIA

HOW TO EXAMINE MIXED STORAGE BEANS.

By Mr. M. Naito and Mr. S. Ueno, both of the S. M. R. Co. Central Laboratory.

Beans, which are the chief agricultural produce of the Orient, especially Manchuria, are put out to the total amount of 18,000,000 *koku* by the latest returns, and the annual total is on the increase year after year. When the Sungari Valley, the Upper Liao, and wild land in North Manchuria are reclaimed, the increase

GENERAL VIEW OF S. M. R. CO. AGRICULTURAL EXPERIMENTAL STATION, KUNGCHULING,

(Where improved seed beans have been raised for distribution).

Pl. 1.

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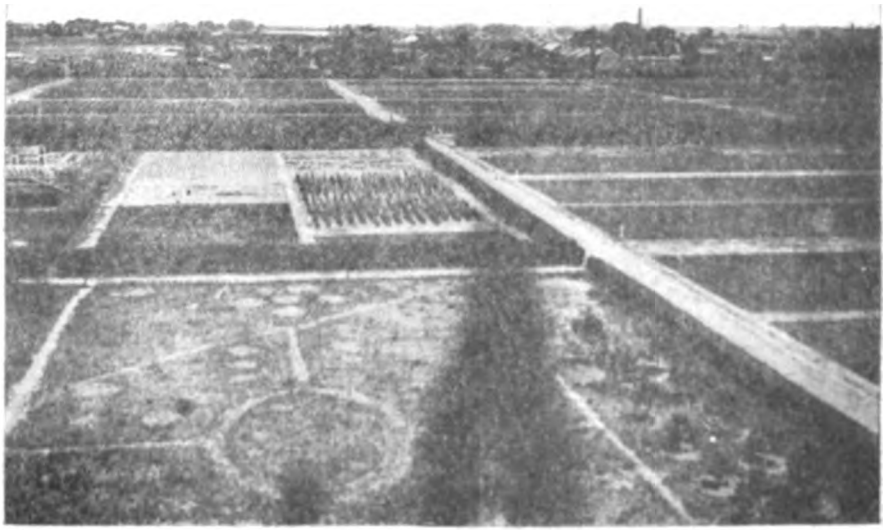
of the aggregate outputs by further 5,000,000 *koku* is thought to be realized in the immediate future.

Now in Manchuria, some 4,000,000 *koku* is consumed as seed-beans, food-stuff, material for Chinese household mills, etc. The remainder is available for export in the form of Beans and Bean Cake and Oil.

Until recently, no examination had been held over Beans as an article of commodity. But, in view of the steadily increasing tendency of both outputs and export amounts year by year, the South Manchuria Railway Company was persuaded to introduce, from the triple consideration of transport, storage, and economy, what has been known as the Mixed Storage System in December, 1919.

All along the South Manchuria Lines, seventeen stations were listed as the places where Beans may be accepted for mixed storage; the two ports of Dairen and Yingkou have been made the points where the Bean stocks entrusted to the Company's custody may be taken out; Beans are classified into Special, First,



Ph. 2.

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Second, and Rejected Classes, of which the last mentioned are not accepted for Mixed Storage.

For the standards, by which the stocks presented for examination are classified, samples once used to be collected from various localities and graduated the same as above mentioned, and the samples belonging to the same classes were mixed together to be made into the standard samples.

At present, the above method has somewhat been altered. The different classes of samples are adopted at the points along the Railway Lines where Beans are produced in the greatest abundance, and these samples are distributed to the other Mixed Storage Stations.

In graduating Beans of different qualities for the standard samples, the following criterions are observed under the Mixed Storage System :—

a) Shape and Size (15 points)
1½ points being deducted as it goes one grade lower

Fig. 3.

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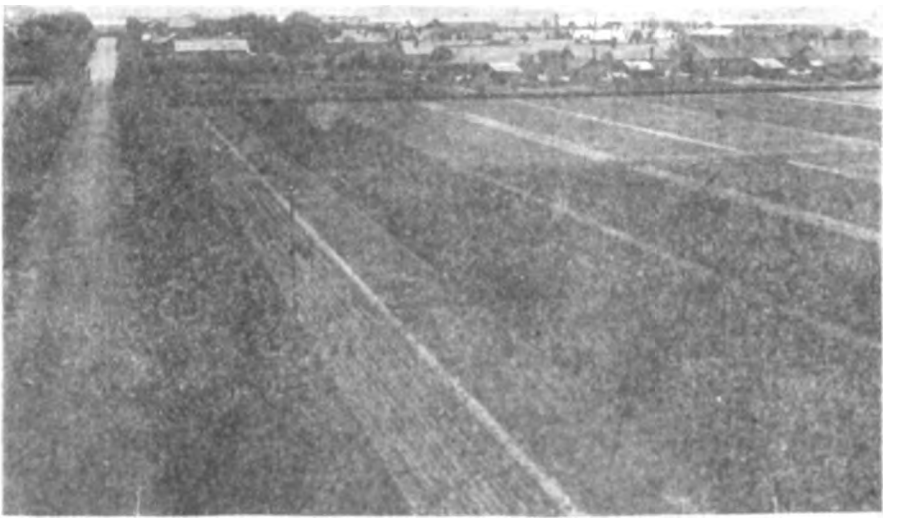
b) Weight of 1 *sho* nearly 1/20 bushel (10 points)
The full mark is 350 *monme* (2.9 lbs.), 1 point being deducted for every 5 *monme* less.
c) Lustre. (15 points)
The full mark is given such as is of the characteristic colour with a fine lustre. 1 point is deducted as it goes one grade lower.
d) Dryness. (25 points)
2½ points are deducted as it goes a grade lower.
e) Purification (30 points)
95, % in purity is accepted as the full mark, 5 points being reduced as it goes a grade lower.
Total (100 points)

Beans credited with 90-100 points are graduated as of Special Class; those of 80-90 points, as of First Class; and such as are of 70-80 points, as of Second Class.

As to the shape, size, and lustre, the eye verdicts of the examiners, who are men of ripe experience, are abided by.

The degree of dryness is judged by the examiners' touch and cracking with the teeth.



Pl. 4.

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As to the purification, it has been included among the items of examination with a view to precluding a mean trick that might be played by cunning dealers and also to inculcating the farmers. It is to see what amount of foreign matters are mixed with the Beans and aims at minimizing the amount of earth or dirt that may have been mixed either naturally or on purpose, and also the amount of weed-seeds, etc. Much importance is attached to this item.

The above will show that, barring the weight, the other items appeal to either the visual or the tactile faculty. This may imply that a latitute of opinion is left to the discretion of the examiners concerned. But the above principles of examination have been adopted, because, by following any scientific method, a large quantity of Beans cannot be expected to be intelligently graduated in a short space of time.

The South Manchuria Railway Company is therefore always mindful of enhancing the competency of the authorized examiners. So far the examiners'

Ph. 5.

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verdicts have been accepted implicitly, but the Company has been subjecting occasionally the Beans examined by these examiners to technical or scientific tests, to see how far their verdicts actually coincide with the results of scientific or chemical overhauls. In fact, some such course is eminently desirable in order to uphold the absoluteness of the opinions of the authorized examiners.

We have been actuated by the above to take up first of all the analyses of Beans of varying grades of different places of origin, and in hopes of formulating, if possible, a new method of rational examination, by which the standards of judgment may be indicated more clearly and definitely, we have experimentally studied the relation between the constituents of Beans and specific gravity, and also the relation between the different grades of Beans and specific gravity that, to our knowledge, have not yet been touched upon by any specialist.

Again, we have assumed that a separate standard of judgment should be used in dealing with Beans for manufacture of oil and such as are intended for the extraction of the legumin, and because of this assumption, due attention has always been turned to this very point. As a result of our experiments, we have found that something is amiss in the eye verdicts hitherto in vogue.

However, this must be borne in mind that comparatively little Beans are exported abroad other than to Japan, as they are. A major portion is used by the oil mills at Dairen for export as Bean Oil and Cake. On this account, the exterior appearances of Beans count but little; what is of more practical value in Beans is a high percentage of oil contained therein.

Recently the Agricultural Experimental Station of the S. M. R. Co., at Kungchuling, carried out an investigation of the relation between such peculiar properties of Beans as colour, size, shape, lustre, colour of the eye, etc., on one hand, and the oil and legumin percentages on the other.

According to the results of the investigation, those which have a high percentage of oil and legumin may be tabulated as under:—

	Such as have high oil percentage	Such as have high legumin percentage
Size of grain	Does not count	Does not count
Shape	round	Rather flat
Lustre	Lustrous	Lustreless
Colour of eye	Black & light brown	Deep black & light brown
Colour	Bluish yellow	Deep blue
Colour of cotyledon	Yellow	Deep yellow.

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However, there exists no record of any treatise written on the relation between the specific gravity and the chief constituents of Beans.

Consequently, the study of specific gravity concerning the Mixed Storage Beans for the fiscal year 1919 was taken up.

The mean specific gravity of Beans was sought and obtained as under:—

Table II.

Produced at	Fully shaped	Not fully shaped	Impurities	Specific gravity
	%	%		
Tingchuan	95.90	3.0	1.0	1.216
Fanchuatun	93.60	6.0	0.6	1.229
Kungchuling	91.42	4.8	0.8	1.228
Kuochiatien	95.20	4.2	0.7	1.238
Shuangmaotzu	94.00	5.0	0.4	1.228
Changtu	89.60	9.1	1.0	1.223
Kaiyuan	92.85	6.0	0.5	1.226
Yentai	92.65	7.0	0.3	1.228
Liaoyang	95.60	4.0	0.5	1.228
Chengchiatun	88.35	10.9	0.7	1.229
Changchun	94.20	5.1	0.7	1.218
Average ...	93.20	6.0	0.7	1.225

The above table shows the average specific gravity of Beans to be 1.225. With a desire to formulate a method to ascertain specific gravity, which is simpler and more practical, a liquid having the same degree of specific gravity was prepared, and this was made the standard. Into this liquid, Beans were thrown and those that sank were distinguished from others that floated up on the surface, so as to determine their comparative specific gravity. The authors of this article shall refer to this as "comparative specific gravity." If chloroform (1.48-1.49 in specific gravity), about 600 c. c., according to the Japanese Pharmacopoeia, is mixed, with alcohol (0.83 in specific gravity), 380 c. c.-400 c. c., also according to the Japanese Pharmacopoeia, a liquid of about 1.225 in specific gravity will be obtained.

As a fear was entertained about the oil in Beans being extracted, in case of their being soaked in the above mentioned liquid, a test was made separately with Beans ground fine and also with Beans, as they were. It was found that ground Beans exuded part of oil they contained at once, but that as to natural Beans, as they were, they only got decolourized slightly, even after being left alone for a day. Thus, our fear concerning the exudation of oil was dispelled.

One or two litres of this specific gravity liquid were taken into a mess cylinder, and into this liquid grain Beans were thrown. Such as were lighter than the

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specific gravity liquid floated up to the surface, whilst the heavier grains sank down, those of the same specific gravity being suspended halfway.

Next, 200 grammes of Beans of Special Class were put in the liquid; about 60 grammes thereof floated; 127 grammes sank; and 13 grammes were suspended halfway. What floated up was then transferred to a liquid 0.005 lower in specific gravity. There were 16.5 grammes of those betwen 1.225 and 1.220 in specific gravity. Then, such as floated in the second liquid were transferred into a liquid 0.005 lower in specific gravity. It was found that 11 grammes of them sank between 1.220 and 1.215 in specific gravity. A like process was repeated in succession, and the following table was obtained:—

Table III.

Specific gravity	Grammes	Specific gravity	Grammes
1.170	2.0	1.230	5.5
1.175	2.0	1.235	18.0
1.180	1.0	1.240	17.5
1.185	1.0	1.245	15.5
1.190	3.0	1.250	29.0
1.195	3.5	1.255	10.0
1.200	5.5	1.260	9.0
1.205	5.5	1.265	8.5
1.210	9.5	1.270	7.0
1.215	11.0	1.275	3.0
1.220	16.5	1.280	2.0
1.225	13.0	1.285	2.0

As seen from the above, the lightest was 1.17 in specific gravity, whilst the heaviest was 1.285 in s. g., nearly coinciding with the mean specific gravity of 1.225.

It occurred to us then that, if this method can be available for the graduation of Beans submitted to the Wharf examiners for examination, the process would be comparatively simplified.

Next, the Beans giving the lowest and highest specific gravities, as above mentioned, were analyzed, the results of analyses being as follow:—

Table IV.

	Beans	
	of 1.175 in s. g. or less	of 1.280 in s. g. or more
Moisture	9.83 9.91	9.56 9.58
Oil	18.13 18.05	15.88 15.99
Legumin	37.45 37.47	41.05 40.75

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As indicated above, a remarkable variation was noted between the percentages of oil and legumin according to the difference in specific gravity.

It may be observed that the lighter is the specific gravity, the larger is the oil percentage, and the lower the legumin percentage; on the contrary, such as are heavy in specific gravity are short of oil percentage, but rich in legumin percentage.

Then, we became curious to learn what results might be attained, if the gradation of Mixed Storage Beans were to be based upon the specific gravity, and proceeded to find what data could be gained by putting in the standard liquid of 1.225 in specific gravity the standard samples of Special, First, and Second Class Beans for the fiscal year 1919, with regard to what floated and sank.

Note: Prior to the experiments, a certain amount of Beans was taken and they were freed from what impurities they contained. Then such as floated and sank were divided. Next, each kind was divided into what was fully shaped and otherwise. What is not fully shaped consists of broken, unripe, decayed, and weevilled grains.

Further, in order to distinguish the larger and smaller-sized grains, the Beans were sifted with a sieve, the meshes of which were 6 millimetres square. The following is a general plan of the tables:—

Beans.

of 1.225 or less in specific gravity

Fully shaped ... ... { Those over 6 millimetres / " under " } in grammes & number of grains

Not fully shaped ... { Those over 6 millimetres / " under " } "

of 1.225 or more in specific gravity

Fully shaped ... ... { Those over 6 millimetres / " under " } "

Not fully shaped ... { Those over 6 millimetres / " under " } "

Impurities

Table V.

Special Class Beans.

%

Sample	Fully shaped		Not fully shaped		Impurities
	grammes	No. of grains	grammes	No. of grains	
1	94.0	584	0.0	44	0.2
2	94.0	576	6.0	44	0.2
3	96.0	590	4.0	30	0.1

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Sample	Fully shaped		Not fully shaped		Impurities
	gramme	No. of grains	gramme	No. of grains	
4	96.0	576	4.0	36	0 3
5	96.0	586	4.0	41	0.2
6	96.0	575	4.0	40	0.3
7	93.0	566	6.5	42	0.2
8	94.0	584	6.0	32	0.2
9	94.0	554	5.5	33	0.5
10	95.0	576	4.5	30	0.5
Average	94.8	576	5.0	38	0.35

First Class Beans.

%

Sample	Fully shaped		Not fully shaped		Impurities
	gramme	No. of grains	gramme	No. of grains	
1	91.0	630	9.0	82	—
2	90.0	622	10.0	88	—
3	89.0	640	11.0	120	—
4	90.0	658	10.0	108	—
5	90.0	636	10.0	96	—
6	92.0	624	8.0	77	0.5
7	92.0	655	8.0	79	—
8	92.0	634	7.5	75	—
9	92.0	633	8.0	79	0.5
10	92.0	646	7.5	83	—
Average	92.0	638	7.5	80	0.5

Second Class Beans.

%

Sample	Fully shaped		Not fully shaped		Impurities
	gramme	No. of grains	gramme	No. of grains	
1	90.0	606	9.0	108	1.0
2	91.0	572	8.0	100	0 8
3	90.0	608	9.0	104	1.0
4	92.0	584	7.0	88	1.0
5	89.0	562	9.0	90	1.8
6	92.0	577	7.2	77	0 8
7	91.5	572	8.0	77	0 5
8	91.0	584	8.0	72	1 0
9	93.0	601	6.5	65	0 7
10	93.0	580	6.0	70	1 0
Average	91.3	585	7.7	86	1 0

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Special Class Beans.

Above & under standard specific gravity

%

(a) of 1.225 or under

Sample	Fully shaped		Not fully shaped	
	gramme	No. of grains	gramme	No. of grains
1	22.0	138	4.0	28
2	24.0	150	2.0	14
3	24.0	148	2.0	16
4	25.0	156	2.6	24
5	25.0	150	2.0	18
6	29.0	179	2.5	20
7	30.0	180	3.0	24
8	31.0	202	3.0	20
9	30.0	179	3.0	20
10	32.0	188	2.5	17
Average	27.2	168	2.7	20

(b) of 1.225 or more

Sample	Fully shaped		Not fully shaped	
	gramme	No. of grains	gramme	No. of grains
1	72.0	446	2.0	16
2	70.0	430	4.0	30
3	72.0	448	2.0	14
4	71.0	420	2.0	15
5	71.0	430	2.0	15
6	67.0	405	1.5	12
7	63.0	386	3.5	18
8	63.0	380	3.0	12
9	64.0	375	2.5	13
10	63.0	388	2.0	13
Average	67.2	410	2.5	17

First Class Beans.

Above & under standard specific gravity

%

(a) of 1.225 or under

Sample	Fully shaped		Not fully shaped	
	gramme	No. of grains	gramme	No. of grains
1	36.0	254	6.0	52
2	36.0	252	6.0	50
3	34.0	254	7.0	70

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Sample	Fully shaped		Not fully shaped	
	gramme	No. of grains	gramme	No. of grains
4	38.0	366	6.0	60
5	37.0	260	6.0	56
6	35.0	220	5.0	45
7	36.0	250	3.5	40
8	35.0	242	3.5	45
9	38.0	278	5.0	54
10	34.0	236	4.0	42
Average	35.8	255	5.1	50

(b) of 1.225 or more

Sample	Fully shaped		Not fully shaped	
	gramme	No. of grains	gramme	No. of grains
1	54.0	376	3.0	23
2	54.0	370	4.0	29
3	55.0	380	4.0	33
4	52.0	352	4.0	30
5	54.0	376	4.0	20
6	56.0	404	3.0	30
7	56.0	405	4.5	34
8	54.0	392	4.0	35
9	58.0	395	3.0	25
10	57.0	410	3.5	31
Average	55.0	383	3.7	31

Second Class Beans.

Above & under standard specific gavity

%

(a) of 1.225 or under

Sample	Fully shaped		Not fully shaped	
	gramme	No. of grains	gramme	No. of grains
1	46.0	312	7.0	68
2	58.0	360	6.0	60
3	47.0	320	7.0	70
4	44.0	274	5.0	46
5	47.0	272	6.0	44
6	45.0	292	5.0	45
7	48.5	314	5.5	43
8	51.0	324	6.0	49
9	49.0	312	4.5	40
10	43.0	295	4.0	38
Average	48.0	300	5.6	50

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Table VI.

Special Class Beans.

Percentage of larger & smaller Beans.

Above 6 millimetres in size

Sample	Fully shaped		Not fully shaped	
	gramme	No. of grains	gramme	No. of grains
1	71.0	404	2.0	9
2	76.0	440	3.2	21
3	70.0	398	1.6	10
4	71.0	376	1.6	12
5	70.0	380	1.1	14
6	71.5	393	1.3	10
7	68.0	371	2.0	14
8	71.5	398	1.2	9
9	72.5	397	1.5	13
10	73.0	401	0.8	9
Average	71.4	360	1.6	12

Under 6 millimetres in size

Specimen	Fully shaped		Not fully shaped	
	gramme	No. of grains	gramme	No. of grains
1	23.0	180	4.0	30
2	18.0	130	2.8	24
3	26.0	202	2.4	20
4	25.0	200	3.0	26
5	26.0	200	3.0	30
6	24.5	182	2.8	24
7	25.0	195	4.5	28
8	23.5	184	4.8	23
9	21.5	157	4.0	20
10	24.0	175	3.7	22
Average	23.6	181	3.5	25

First Class Beans.

Percentage of larger & smaller Beans

Above 6 millimetres in size

Sample	Fully shaped		Not fully shaped	
	gramme	No. of grains	gramme	No. of grains
1	40.0	250	2.0	12
2	43.0	241	2.4	12
3	30.0	210	1.0	10

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Sample	Fully shaped		Not fully shaped	
	gramme	No. of grains	gramme	No. of grains
4	38.0	214	1.6	18
5	43.0	236	1.4	20
6	44.0	256	2.5	17
7	45.5	254	0.7	11
8	50.0	274	2.0	17
9	46.5	260	0.8	11
10	46.0	264	1.6	16
Average	44.8	247	1.4	14

Under 6 millimetres in size

Sample	Fully shaped		Not fully shaped	
	gramme	No. of grains	gramme	No. of grains
1	35.0	374	7.0	70
2	47.0	380	7.6	80
3	53.0	430	10.0	110
4	51.0	444	8.4	88
5	58.0	400	7.6	72
6	47.0	368	5.5	80
7	49.5	400	7.3	75
8	41.5	360	5.5	58
9	45.5	383	7.2	73
10	46.0	362	5.0	60
Average	47.3	392	6.2	70

Second Class Beans.

Percentage of larger & smaller Beans

Above 6 millimetres in size

Sample	Fully shaped		Not fully shaped	
	gramme	No. of grains	gramme	No. of grains
1	53.0	352	1.0	12
2	52.0	318	2.3	24
3	51.0	282	1.0	10
4	57.0	316	2.6	24
5	52.0	282	4.0	32
6	55.0	291	2.0	22
7	57.0	316	3.3	22
8	55.0	311	3.8	24
9	53.0	281	2.0	14
10	51.5	239	1.5	13
Average	56.0	297	2.3	19

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Under 6 millimetres in size

Sample	Fully shaped		Not fully shaped	
	grammes	No. of grains	grammes	No. of grains
1	37·0	259	8·0	99
2	39·0	250	5·7	66
3	39·0	320	8·0	98
4	35·0	206	4·4	50
5	37·0	283	5·0	48
6	37·0	280	5·2	55
7	34·5	256	4·7	45
8	39·0	273	4·2	48
9	30·5	520	4·5	48
10	41·0	350	4·5	55
Average	37·6	280	5·4	59

The above results will indicate that, as far as the scientific tests are concerned, the percentages of those fully shaped and not fully shaped, and impurities including such as float and sink, nearly agree with Beans of the same classes. But, as regards the sizes of Bean grains, 1st class Beans are often found to be more lacking in uniformity of size, although it may be said that this lack in uniformity does not necessarily imply inferiority in quality.

To reiterate the percentages of larger and smaller sizes of Beans, giving the results of siftings with a 6 millimetre sieve: —

Table VII.

Beans	Above 6 millimetres		Under 6 millimetres	
	grammes	No. of grains	grammes	No. of grains
Special Class	73	410	27·0	206
First Class	49	260	53·0	446
Second Class	59	316	43·0	330

Next, to repeat the results of distinction by specific gravity: —

Beans	Specific gravity Under 1.225	Specific gravity Over 1.225	Ratio of those above to those under
Special Class	30·9	69·7	1—2·32
First Class	41·0	58·7	1—1·43
Second Class	54·0	45·0	1—0·81

The variation between the different classes is found to be about 16 %, which goes to confirm the results of the eye-verdict.

Again, when samples of the different grades are put in a mess cylinder containing a liquid of 1·225 in specific gravity, the sample of one grade at a time, it

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has been found that the quantities of what floats up to the surface and what sinks down are reversed in the case of the Special and Second Class Beans.

With Special Class Beans, about two-thirds of the whole sink down, the remaining one-third floating up to the surface. In the case of the Second Class Beans, two-thirds float and the remaining one-third sinks.

As to the First Class Beans, what floats and what sinks are nearly equally divided.

Such being the case, even an inexperienced person may be able to distinguish easily the right class of Beans as may be presented for a verdict. This is a much simpler process of examination, as compared with the other eye-verdict system which requires a good deal of previous experience.

We have already noted that, according to the comparative specific gravity method, Beans that float up to the surface of the liquid contain a greater percentage of oil, and the others that sink down have a higher percentage of legumin.

The results of analysis of the samples of Beans used in the above mentioned experiments are as follow:—

Table VIII.

Results of Chemical Examination.

	Under 1.225 in specific gravity			
	Fully shaped		Not fully shaped	
Special Class.	Under 6 millimetres	Over 6 millimetres	Under 6 mill.	Over 6 mill.
Moisture	9.88	9.83	10.19	9.82
Oil	17.50	17.98	17.51	18.15
Albumen	40.60	41.00	41.30	40.60
Carbohydrate	23.02	22.68	21.31	21.81
Fibre	4.85	4.71	5.40	5.38
Ash	4.15	4.21	4.29	4.23
First Class				
Moisture	9.42	9.31	9.42	9.42
Oil	17.75	17.83	17.91	17.99
Albumen	41.72	41.42	40.25	41.51
Carbohydrate	21.11	21.15	21.35	20.71
Fibre	5.25	5.20	5.48	5.55
Ash	4.75	4.31	4.29	4.33

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Second Class :				
Moisture	10.28	10.34	10.30	10.20
Oil	17.60	18.01	16.46	17.87
Albumen	39.20	39.20	39.20	39.20
Carbohydrate	23.81	22.88	25.21	24.00
Fibre	5.44	5.34	5.44	5.28
Ash	4.20	4.33	4.42	4.35

	Over 1.225 in specific gravity.			
	Fully shaped		Not fully shaped	
Special Class :	Under 6 mill.	Over 6 mill.	Under 6 mill.	Over 6 mill.
Moisture	10.01	10.01	10.51	10.42
Oil	17.03	17.48	17.48	17.77
Albumen	41.13	41.65	41.05	41.65
Carbohydrate	22.43	21.47	21.44	20.95
Fibre	5.35	5.30	5.20	5.10
Ash	4.05	4.09	4.14	4.10
First Class :				
Moisture	9.99	9.87	9.99	9.87
Oil	17.99	17.97	18.87	17.66
Albumen	40.74	41.20	39.38	40.60
Carbohydrate	21.70	22.10	22.70	21.71
Fibre	5.20	5.16	5.18	5.40
Ash	4.28	4.24	4.81	4.76
Second Class :				
Moisture	10.41	10.60	10.59	10.59
Oil	17.17	17.37	16.51	17.02
Albumen	39.20	39.20	40.05	38.30
Carbohydrate	24.36	24.39	20.42	20.52
Fibre	5.41	5.41	5.42	5.40
Ash	4.45	4.13	6.11	4.57

	Average		
Special Class :	of under 1.225 in s.g.	of over 1.225 in s.g.	Total average
Moisture	9.93	10.08	10.08
Oil	17.77	17.53	17.57
Albumen	40.77	41.51	41.16
Carbohydrate	22.23	21.59	21.90
Fibre	5.08	5.19	5.19
Ash	4.22	4.09	4.15

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First Class:			
Moisture	9.02	9.90	9.91
Oil	17.87	17.61	17.74
Albumen	40.67	40.59	40.63
Carbohydrate	21.87	21.84	21.86
Fibre	5.40	5.29	5.34
Ash	4.27	4.77	4.52
Second Class:			
Moisture	10.33	10.55	10.44
Oil	17.53	17.17	17.35
Albumen	39.20	40.16	39.68
Carbohydrate	23.26	21.89	22.58
Fibre	5.38	5.14	5.39
Ash	4.57	4.82	4.50

The above table indicates that, as far as the chemical constituents are concerned, the three classes of Beans are practically the same. It is true that there is a trifling difference between any two of the three classes, but what difference there is is only such as is ordinarily noticed in the analysis of cereals, and, if seen from a purely chemical point of view, nothing like a graduated difference between the different classes can be observed.

Further, the returns gained by the comparative specific gravity method are noted to agree with the results of the chemical examination above mentioned, in that, throughout all the classes, what floats contains a little more oil percentage than what sinks, and what sinks contains a little more legumin.

It is further noted that, speaking of what floats, the quantity thereof increases as the grade goes lower.

Again, if the peculiarities of each class, as graduated by the eye-verdict of the examiners, are to be differentiated chemically, (1) the special class Beans are found to contain the highest legumin percentage and the lowest oil percentage; (2) the first class Beans to contain legumin and oil in equal quantities; and (3) the second class Beans to contain the highest oil and the lowest legumin percentage. If the oil percentage of Beans were to be set as the standard of classification, the order of the classes would be quite reversed.

Thus, it has been shown that the graduation by the comparative specific gravity method coincides with the results of the eye-verdict.

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Still, the chemical constituents of the different classes of Beans have been considered to await further investigation.

Moreover, since the comparative specific gravity method was used at Dairen Wharves only over the standard Beans of the different classes, it was desired to see if the same apply to the standard Beans at the other places, and samples of the different classes of Beans produced in the fiscal year 1920 along the South Manchuria Railway Lines were subjected to both physical and comparative specific gravity tests, the results obtained being as under:—

Remarks.—The samples used in [illegible] were all standard Beans at the places concerned, as graduated by the official examiner.

Table IX.

Physical Examination %

Average results of five examinations over each sample being given.

		a) Kaiyuan			b) Ssupingkai		
		Special Cl.	1st Cl.	2nd Cl.	Special Cl.	1st Cl.	2nd Cl.
Fully shaped	gramme	97.2	53.1	88.6	97.1	90.1	89.0
	No. of grains	680	700	743	779	768	793
Not fully shaped	"	2.6	5.3	8.7	2.0	7.5	9.3
	"	20	79	135	28	133	167
Impurities		0.2	1.6	2.5	0.8	2.3	2.3
Under 1.225 in s. g.							
Fully shaped	gramme	26.9	26.8	18.1	20.9	22.1	14.0
	No. of grains	198	208	237	162	199	125
Not fully shaped	"	1.8	2.7	4.6	1.4	4.3	5.7
	"	12	39	70	19	76	95
Over 6 milli.	"	2.7	10.3	9.0	5.8	5.5	3.2
	"	69	58	55	51	33	20
Under 6 milli.	"	15.2	16.5	19.0	12.7	16.6	10.8
	"	129	150	181	110	166	105
Over 1.225 in s. g.							
Fully shaped	gramme	70.4	66.3	60.5	76.2	68.0	75.0
	No. of grains	482	491	506	617	569	668
Not fully shaped	"	0.8	2.6	4.1	0.6	3.2	3.6
	"	8	40	67	9	58	72
Fully shaped	"	34.1	27.3	17.3	22.8	23.9	15.3
	"	191	153	98	144	142	92
Not fully shaped	"	36.2	39.0	23.0	53.8	44.3	56.7
	"	291	339	408	471	427	576

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		c) Kungchuling			d) Kuochiatien		
		Special Cl.	1st Cl.	2nd Cl.	Special Cl.	1st Cl.	2nd Cl.
Fully shaped	gramme...	97.4	92.0	87.2	96.0	88.6	82.0
	No. of grains...	584	683	692	703	734	706
Not fully shaped	" ...	2.1	5.1	8.5	3.0	8.0	11.0
	" ...	22	89	130	34	154	175
Impurities		5.0	2.9	4.3	1.0	4.4	7.0
Under 1.225 in s. g.:							
Fully shaped	gramme...	18.4	18.2	18.0	15.3	20.2	16.5
	No. of grains...	103	145	145	186	174	131
Not fully shaped	" ...	1.3	2.7	5.3	2.0	4.1	6.1
	" ...	13	44	75	22	68	91
Over 6 milli.	" ...	13.2	7.8	6.8	12.4	5.8	6.9
	" ...	69	44	39	71	35	41
Under 6 milli.	" ...	5.2	10.4	11.2	12.9	14.6	9.6
	" ...	43	101	106	115	139	91
Over 1.225 in s. g.:							
Fully shaped	gramme...	79.0	73.8	69.2	69.6	67.8	65.5
	No. of grains...	471	538	547	516	560	574
Not fully shaped	" ...	0.8	2.3	3.3	1.0	3.9	4.9
	" ...	9	42	55	12	84	84
Over 6 milli.	" ...	60.2	31.1	26.1	33.7	22.7	21.8
	" ...	322	173	150	191	133	129
Under 6 milli.	" ...	18.8	41.7	43.7	35.9	45.1	43.7
	" ...	140	365	397	325	427	445

		e) Fushun			f) Yentai		
		Special Cl.	1st Cl.	2nd Cl.	Special Cl.	1st Cl.	2nd Cl.
Fully shaped	gramme...	95.2	93.8	91.2	—	93.7	91.2
	No. of grains...	680	684	698	—	702	780
Not fully shaped	" ...	3.8	4.3	6.4	—	5.1	4.2
	" ...	48	65	85	—	57	80
Impurities	... ...	0.8	1.8	2.6	—	0.9	3.5
Under 1.225 in s. g.:							
Fully shaped	gramme ..	36.8	35.7	36.7	—	23.6	22.3
	No. of grains...	263	262	282	—	174	190
Not fully shaped	" ...	2.5	2.2	2.9	—	2.8	2.2
	" ...	29	29	35	—	28	38
Over 6 milli.	" ...	19.3	16.0	16.1	—	12.8	7.9
	" ...	109	90	97	—	74	51
Under 6 milli.	" ...	17.5	19.7	20.6	—	10.8	14.4
	" ...	154	172	185	—	100	139
Over 1.225 in s. g.:							
Fully shaped	gramme...	58.4	58.1	54.5	—	70.3	69.9
	No. of grains...	417	422	410	—	529	596
Not fully shaped	" ...	1.3	2.1	3.5	—	2.3	2.0
	" ...	19	30	50	—	29	42
Over 6 milli.	" ...	20.1	27.3	23.6	—	32.4	24.4
	" ...	104	155	140	—	180	155
Under 6 milli	" ...	20.3	30.8	30.9	—	37.9	45.5
	" ...	253	307	270	—	340	441

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		g) Tiehling			h) Changtu		
		Special Cl.	1st Cl.	2nd Cl.	Special Cl.	1st Cl.	2nd Cl.
Fully shaped	grammes	92.3	91.4	—	95.7	93.0	—
	No. of grains	709	714	—	812	805	—
Not fully shaped	"	5.6	6.0	—	3.1	3.1	—
	"	86	99	—	57	54	—
Impurities		2.2	2.5	—	0.9	2.9	—
Under 1.225 in s. g.							
Fully shaped	grammes	40.4	32.0	—	29.7	19.1	—
	No. of grains	315	257	—	208	177	—
Not fully shaped	"	3.7	2.5	—	1.8	1.9	—
	"	53	39	—	30	31	—
Over 6 milli.	"	12.7	11.5	—	9.1	4.1	—
	"	75	67	—	50	29	—
Under 6 milli.	"	27.7	20.5	—	16.6	15.0	—
	"	240	190	—	152	148	—
Over 1.225 in s. g.							
Fully shaped	grammes	51.9	59.4	—	70.2	73.9	—
	No. of grains	390	459	—	604	688	—
Not fully shaped	"	1.9	3.5	—	1.3	1.2	—
	"	33	60	—	27	27	—
Over 6 milli.	"	19.8	25.9	—	2.04	1.26	—
	"	114	150	—	127	82	—
Under 6 milli.	"	32.1	33.5	—	49.8	61.3	—
	"	270	309	—	477	906	—

		i) Hsintaitzu			j) Liaoyang		
		Special Cl.	1st Cl.	2nd Cl.	Special Cl.	1st Cl.	2nd Cl.
Fully shaped	grammes	94.4	88.7	—	95.8	91.4	85.1
	No. of grains	782	722	—	712	756	734
Not fully shaped	"	4.4	6.7	—	3.1	5.7	7.3
	"	66	99	—	46	85	123
Impurities		1.3	4.6	—	2.1	2.6	6.9
Under 1.225 in s. g.							
Fully shaped	grammes	29.3	34.8	—	33.9	37.0	26.2
	No. of grains	238	311	—	244	299	121
Not fully shaped	"	2.8	4.1	—	1.5	2.9	3.1
	"	35	57	—	2.3	42	49
Over 6 milli.	"	6.8	7.8	—	17.5	15.4	8.3
	"	40	48	—	101	89	51
Under 6 milli.	"	22.5	27.0	—	16.4	21.6	17.9
	"	198	203	—	143	210	170
Over 1.225 in s. g.							
Fully shaped	grammes	65.1	53.9	—	61.9	54.4	59.6
	No. of grains	534	461	—	470	457	517
Not fully shaped	"	1.6	2.6	—	1.6	2.9	4.2
	"	25	41	—	23	43	74
Over 6 milli.	"	15.6	11.1	—	27.5	18.8	14.0
	"	93	67	—	159	111	81
Under 6 milli.	"	49.5	42.8	—	34.4	35.6	45.6
	"	441	394	—	311	346	436

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		k) Fanchiatun			l) Changchun		
		Special Cl.	1st Cl.	2nd Cl.	Special Cl.	1st. Cl.	2nd. Cl.
Fully shaped	gramme...	96.3	69.5	89.5	66.6	91.4	88.5
	No. of grains ..	690	661	661	685	674	993
Not fully shaped	" ...	3.1	4.6	4.6	2.9	6.3	6.6
	" ...	38	59	59	34	81	123
Impurities		0.7	5.9	5.9	0.5	2.3	4.9
Under 1.225 in s. g.:							
Fully shaped	gramme...	15.4	18.4	18.4	29.5	35.6	38.1
	No. of grains...	114	138	119	241	263	344
Not fully shaped	" ...	1.9	2.3	4.0	1.7	3.3	3.6
	" ...	21	19	56	20	30	64
Over 6 milli.	" ...	7.1	8.3	4.3	15.3	17.3	6.9
	" ...	42	48	25	80	103	43
Under 6 milli.	" ...	8.3	10.1	10.0	14.2	18.3	24.0
	" ...	72	90	94	125	160	201
Over 1.225 in s. g.:							
Fully shaped	gramme...	80.9	71.1	73.0	67.1	55.8	50.7
	No. of grains...	576	523	596	471	411	509
Not fully shaped	" ...	1.2	2.3	4.4	1.2	3.1	3.0
	" ...	17	30	67	14	42	59
Over 6 milli.	" ...	40.2	36.6	24.6	30.5	26.1	11.0
	" ...	236	208	240	227	153	67
Under 6 milli.	" ...	40.7	35.0	48.4	27.6	20.7	45.7
	" ...	340	315	452	244	258	532

		m) Shuangmiaotzu		
		Special Cl.	1st. Cl.	2nd. Cl.
Fully shaped	gramme...	95.0	92.8	91.1
	No. of grains...	710	751	751
Not fully shaped	" ...	4.2	4.8	6.3
	" ...	65	73	94
Impurities		0.7	2.3	2.5
Under 1.225 in s. g.:				
Fully shaped	gramme...	24.3	21.0	23.1
	No. of grains...	190	175	184
Not fully shaped	" ...	2.3	2.6	3.8
	" ...	35	30	50
Over 6 milli.	" ...	11.0	7.3	9.8
	" ...	64	43	58
Under 6 milli.	" ...	13.4	14.6	13.3
	" ...	129	132	120
Over 1.225 in s. g.:				
Fully shaped	gramme...	70.6	70.9	68.0
	No. of grains...	520	576	550
Not fully shaped	" ...	1.9	2.2	2.5
	" ...	30	36	38
Over 6 milli.	" ...	33.5	20.3	26.3
	" ...	198	121	153
Under 6 milli.	" ...	37.1	50.6	41.7
	" ...	322	455	403

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A review of the above table will tell that the results of physical experiments vary according to places.

Then, larger sized samples (of over 6 millimetres in diameter) have been extracted from the above table as under :—

Table X.

	Percentage			Number of grains		
	Under 1.225 m. m. g.			Over 1.225 m. m. g.		
	Special Cl.	1st Cl.	2nd Cl.	Special Cl.	1st Cl.	2nd Cl.
Changchun	15.2	17.3	6.9	39.5	26.1	11.0
Fanchiatun	7.1	8.3	4.3	40.2	30.1	24.6
Kungchuling	73.2	7.8	0.8	60.2	31.7	20.1
Kuochiatien	12.4	5.8	0.9	33.7	22.7	21.8
Suipingkai	8.5	5.5	3.2	22.8	23.9	15.3
Shuangmiaotzu	2.0	7.3	0.9	31.5	20.3	20.3
Changtu	0.1	4.1	—	20.4	12.6	—
Kaiyuan	11.7	10.3	9.0	34.1	26.3	17.3
Tiehling	12.7	11.5	—	19.8	25.0	—
Hsintaitzu	6.8	7.8	—	15.6	11.1	—
Fushun	19.1	16.0	16.1	29.9	27.4	23.0
Yentai	—	12.8	7.9	—	32.4	24.4
Liaoyang	17.5	15.4	8.3	27.5	18.8	14.0
Average	12.0	10.0	7.9	33.7	24.3	20.4

	Special Cl. Total	1st Cl. Total	2nd Cl. Total
Changchun	54.8	43.4	17.9
Fanchiatun	47.3	44.4	28.9
Kungchuling	73.4	39.5	32.0
Kuochiatien	46.1	28.5	25.7
Suipingkai	31.3	29.4	18.5
Shuangmiaotzu	44.5	27.6	30.1
Changtu	20.5	16.7	—
Kaiyuan	45.8	37.6	26.3
Tiehling	32.5	37.4	—
Hsintaitzu	23.4	18.9	—
Fushun	48.4	43.3	39.7
Yentai	—	45.2	32.3
Liaoyang	45.0	34.2	22.3
Average	43.4	34.3	28.4

From the above table, the number of grains of special class Beans is often larger than that for 1st or 2nd class Beans. Still the ratios between the different classes are not always constant, but are subject to variation according to places.

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For instance, taking 2nd class sample of Changchun for 1, the basis of comparison, 1st class sample goes up to 2.42, and special class sample to 3.06. However, speaking of Ssupingkai samples, 1st and special class samples are 1.58 and 1.69 respectively to 2nd class sample as 1.

Then, 2nd class samples of different places are not at all the same. For instance, both Changchun and Ssupingkai give each 18.0 for 2nd class sample, while Kungchuling, Shuangmiaotzu, and Fushun each gives more than 30.0. The low figure of 1st class sample of Changtu and Hsintaitzu is striking.

As to special class samples, the number of grains is found to vary only slightly, but Changtu and Hsintaitzu give only 220 or 290 grains. Such a difference may owe its origin to some local peculiarities, but at any rate, on the whole, the figures are rather irregular.

However, seeing that there is some likeness among the number of grains of special class samples, the size of grains may be conceded as an item of importance in determining the quality of Beans.

The average numbers of grains of Beans of over 6 millimetres of different classes produced at different points are as under:—

2nd Cl. Beans, 28.4%
1st Cl. Beans, 34%
3rd Cl. Beans, 43.4%

Taking 2nd class Beans for 1, 1st class Beans make 1.21, and 3rd class Beans 1.52.

However, none of any tabulated above is found to graduate at approximately such ratio.

Now, assuming the 2nd class total in the preceding table as 1, the comparative ratios may be tabulated as follow:—

Table XI.

	Special Cl.	1st Cl.	2nd Cl.
Changchun	3.06	2.42	1
Fanchiatun	1.70	1.25	1
Kungchuling	2.23	1.20	1
Kuochiatien	1.61	0.99	1
Ssupingkai	1.69	1.58	1
Shuangmiaotzu	1.23	0.76	1
Changtu	1.10	1.00	—

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	Special Cl.	1st Cl.	2nd Cl.
Kaiyuan	1.07	1.04	1
Tieling	0.70	1.00	—
Hantatzu	1.18	1.00	—
Fushun	1.22	1.09	—
Yentai	—	1.40	1
Liaoyang	2.02	1.53	1

Next, with the standard Beans of the fiscal year 1919 (Mixed Storage goods at the Dairen Wharves), they could be graduated into their proper classes by the margin in specific gravity, and so the same method was applied to Beans produced in the fiscal year 1920, the quotations from Table IX being as under :—

Table XII.

Comparison by Graduation by Specific Gravity.

Percentage : Number of persons.

	Under 1.225 in s. g.			Over 1.225 in s. g.		
	Special Cl.	1st Cl.	2nd Cl.	Special Cl.	1st Cl.	2nd Cl.
Changchun	31.7	38.9	35.4	68.3	58.9	59.7
Fanchiatun	17.3	20.7	18.3	82.1	73.7	77.4
Kungchuling	19.7	20.9	23.3	79.8	70.1	72.5
Kuochiatien	27.3	24.3	22.6	70.6	71.7	70.4
Saupingkai	22.2	20.4	19.7	70.8	71.2	78.6
Shuangmaotzu	26.7	24.5	20.9	72.5	73.1	70.5
Changtu	27.5	21.0	—	71.5	75.1	—
Kaiyuan	28.7	29.5	32.7	71.2	68.9	64.6
Tieling	44.1	34.5	—	53.8	62.9	—
Hantatzu	32.1	38.9	—	66.7	56.5	—
Fushun	30.3	37.9	39.0	59.7	60.2	58.0
Yentai	—	20.4	24.5	—	72.6	71.9
Liaoyang	35.4	30.9	29.3	63.5	57.3	63.8

If such as are under 1.225 in specific gravity be accepted as the unit, the comparative ratios for those over 1.225 in specific gravity are as under :—

Standard Beans of fiscal year 1920 :

Table XIII.

	Special Cl.	1st Cl.	2nd Cl.
Standard Beans of fiscal year 1919	1—2.32	1—1.43	1—0.81
Changchun	2.18	1.51	1.69
Fanchiatun	4.74	3.56	4.23
Kungchuling	4.05	3.04	3.11
Kuochiatien	2.58	2.95	3.12
Saupingkai	3.44	2.65	3.99
Shuangmaotzu	2.71	2.98	2.60
Changtu	2.60	3.59	—

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	Special Cl.	1st Cl.	2nd Cl.
Kaiyuan	2.48	2.36	1.98
Tiehling	2.21	2.57	—
Hsintaitzu	2.06	1.20	—
Fushun	1.52	1.59	1.46
Yentai	—	2.75	2.93
Liaoyang	1.79	1.43	2.17

A glance at the above table will tell what a wide variation separates Beans of different origin, in striking contrast with the standard samples for the fiscal year 1919, the classes of which, as already shown, were distinctly separated from one another by comparative specific gravity.

The Changchun outputs may be picked up as approximately near, still special class Beans denote 1—2.18; 1st class Beans denote 1—1.51; and 2nd class Beans denote 1—1.69. It is not at all like the standard samples for the preceding year, each separated from the other class by the almost uniform difference of 16. 2nd class goods suggest that they compare well for their class with special and 2nd class goods.

It occurred to us that, in the case of the outputs of the fiscal year 1919, the samples were left for a long time at a dry place, and their moisture percentage was brought to an average level, thereby helping to create the almost uniform variation between any two of the graduated classes, whilst, with the outputs of the fiscal year 1920, because of the short period that elapsed after their harvests, their degrees of dryness varied necessarily, and the results failed to show a sign of a regular progression.

Therefore, an experimental enquiry was made into the relation between moisture and specific gravity as undermentioned:—

Taking a quantity of fully shaped Beans, that sank in a liquid of 1.225 in specific gravity, it was assorted in liquid ascending in specific gravity by 0.005. The specific gravity and weight of each group were measured, and then each group was put in a vessel, to be left in exicators containing water for about ten days. Then, they had their specific gravity and weight re-measured and the quantity of the moisture absorbed was also measured. Lastly, the specific gravity of each group was observed, as may be seen from the under mentioned table:—

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Table XIV.

Specific gravity (original)	1.230	1.235	1.240	1.250	1.260
Weight (")	16.4	11.0	11.0	10.7	11.4
Weight increased by moisture absorbed ...	18.5	12.2	12.2	11.7	11.5
Quantity of moisture increased ...	2.1	1.1	1.1	1.0	1.1
Specific gravity with increased moisture ...	1.190 – 1.220	1.190 – 1.220	1.220 – 1.230	1.240 – 1.245	1.220 – 1.225
Margin in specific gravity	0.010 – 0.04	0.010 – 0.04	0.010 – 0.02	0.005 – 0.01	0.035 – 0.04

Thus, it is noted that, by the increase of about 10% of moisture, the widest margin of specific gravity was 0.04 and the narrowest 0.01. But such Beans could be told by the naked eye that they contained more than a normal quantity of moisture. They lost much of the lustre and got swollen. If pressed with the tip of a finger, the skin would come off readily and could be easily crushed.

Now, the difference in specific gravity of dry Beans is 1.17 for the lowest and 1.285 for the highest, the actual difference being 0.115. Next, compared with the standard specific gravity of 1.225, the difference from those above 1.225 in s. g. is 0.06, and that from those under 1.225 in s. g. is 0.05.

Thus, since the difference in specific gravity between the intrinsic properties of Beans is comparatively large, it is plain that what small increase in moisture does not affect the appearance produces no considerable effect on the specific gravity.

If the differences noted in the above tables resulted from a cause other than just suggested, it may be inferred that either the eye and contact-verdict of the authorized examiners is not always reliable, or else an examining method by specific gravity can hardly be applied to a natural produce like Beans with a passable measure of accuracy.

But, a question of such magnitude cannot be decided by the results of only one experimental examination, but must be either confirmed or contradicted by further tests. On this account, the authors of this article intend to pursue the study.

From the various practical experiments above stated, as may be seen from Table 8, Beans of different classes have veritably the same constituents, irrespective of shape or size or no matter either cracked or weevilled, if seen from the chemical viewpoint. Therefore, the basis of judgment may be said to depend a good deal upon the amount of impurities contained.

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If, as a merchandise, the lustre, uniformity of size, and purification are to be taken into account in graduating Beans, the method followed hitherto may be adopted.

The comparative specific gravity method adopted as a scientific one which is comparatively easy of execution has been found to work admirably with the outputs of the fiscal year 1919, but to result otherwise with the produce of the fiscal year 1920.

Still, if, by following this method, some principle for common application towards rendering the process more dependable should be discovered after repeated experiments, it would become a surer guide to the graduation of Beans.

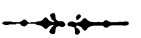
From the samples produced in the fiscal years 1919 and 1920, such as are rich in oil percentage float on the specific gravity liquid, whilst those containing more legumin sink. On this account, the specific gravity method may be found handy according to the purpose for which Beans are intended.

Since the outputs of the fiscal year 1920 appeared generally inclined to sink in the specific gravity liquid, they may be considered as having less oil and more legumin.

As regards a natural produce like Beans, the local peculiarities of the places of origin must be taken into reckoning. So, it would be difficult to judge the quality of Beans by any fixed standard.

But, since the standard samples must needs be selected every year, the traditional method by the exercise of the eye and contact touch ought not to be maintained, unsupplemented by the results of physical and chemical experiments upon the chief constituents of Beans. The such supplementation will make the process the most suitable one.

Again, the carrying-on of physical and chemical experiments upon the standard samples is believed to help much to improve the knack of the authorized examiners in classification of Beans.



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IMPORT OF MANCHURIA BEAN OIL INTO THE UNITED STATES AND ITS USES.

By Mr. I. Sanka,
of S. M. R. Co. Agricultural Office.

I. History of Manchurian Beans in the United States.

Technically Beans are called "glycine hispide maxim." According to Mr. De Candolle, it originated in Cochin China, the southern parts of Japan, and Java (*vide* Origin of Cultivated Plants, p. 331-332).

However, there are indications that this particular plant has been reared in Japan and China from ancient times. Especially, in China, Beans are said to have been known as early as 5,000 years ago.

Still, the introduction of Manchurian Beans to the West was a matter of a comparatively recent date. It seems to have been imported first into England in 1790. They were probably raised by some curiosity-hunters more as a strange plant of Oriental origin than from an economic consideration.

In 1873, Beans were sent as exhibits by Japan and China to the International Exhibition held at Vienna, Austria. They drew the attention of Prof. Haberlandt (one of the acknowledged botanical authorities in that country), and he published the results of his investigations concerning them. This helped much to advertize Manchurian Beans.

In the United States, Beans awakened interest in the people as late as 1804. The "Soy Bean Industry in the United States by W. J. Morse," p. 3, was read with avidity. In 1829, Mr. Nuttall had an interesting article by him inserted in the "New England Farmer," which led to the trial cultivation of Beans with the object of determining their economic value. Then, Commodore Perry, who succeeded in opening the door of the long secluded Japan, took home with him among other things samples of a couple of kinds of Beans native in Japan. These samples added a zest to the interest in the plant already roused. This occurred in 1854. Experimental raising at the different agricultural experimental stations followed. Still, the interest remained only localized.

About that time, the farming classes of the United States had been eagerly looking for some cheaper substitute for such expensive cattle-feed as maize, cotton-

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seed, etc., and also for some suitable substitute for clover, when the crop failed. This casting about for some suitable substitute had indeed formed one of the focuses of a nation-wide effort of the agricultural America. At that juncture the happy idea that Beans might fill the keenly-sought need flashed over the mind of some resourceful specialist, and a long series of experiments was taken in hand. It was found that Beans can be easily raised; that they are highly propagative; that, as cattle-feed, the stem and leaves, not to speak of Beans themselves, are nutritive and inviting to many classes of live stock; and also that, for green manure, the stem and leaves compare favourably with clover in point of fixing the nitrogen in air.

These valued discoveries heightened the glowing interest in the Asiatic plant at the agricultural stations. The rapid growth in Bean cultivation in the United States during these dozen years or so has been the result.

For instance, in 1917, the cultivation area for Beans was 750,000 acres, just about treble the total area set apart in the preceding year, 1916.

In particular, the three States of Illinois, Delaware, and Alabama have expended greater effort upon Bean cultivation, reaping correspondingly richer returns.

Judging by reports gathered from different sources, in that part of the United States south of 40° N. L., Beans have been ascertained as plantable everywhere.

Let us now see what is the harvest returns for Beans per acre. On an average 1,540 bushels may be obtained per acre on 60 lbs. of seed beans, which means that 1 lb. of seed Beans produces slightly over 25 bushels.

Next, at the Delaware Agricultural Experimental Stations, experiments were conducted with 50 kinds of Beans. The results showed that the harvests ranged from 36.1 bushels, the highest, to 14.6 bushels, the lowest, per acre, giving the average of 25.7 bushels. On analysis, the Beans gave 18% of oil and 39.2 of legumin on an average. The oil percentage ranged between 20.4% and 14.1%; legumin between 44.8% and 35%. It is added that in ordinary circumstances the higher the oil percentage is, the lower is the legumin percentage.

However, taking the United States as a whole, bean cultivation is carried on at a far less density than such bean centres as Manchuria and Japan, as may be noted from the undermentioned table giving comparative data of the areas of bean cultivation and outputs in the three countries:—

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	Area of cultivation	Output
	Ha.	*K. Kin*
The United States	[illegible]	500,000
Japan ...	1,110,000	3,800,000
Manchuria ...	[illegible]	18,800,000

The figures for the United States have been obtained from a book entitled "Study of Manchurian Beans" (in Japanese); those for Japan from the returns prepared by the Ministry of Agriculture and Commerce; and those for Manchuria are an estimate found out by the author.

As already stated, in the United States, Beans are raised more for cattle-feed and green manure than as food-stuff or for industrial purposes, what is used for the latter being only in a limited quantity.

Small Bean Mill, Dairen.

The demand for Bean Oil in the United States in recent years has increased immensely. Where does she draw her supply from? The supply goes mostly from Manchuria, the interior of China, and Japan, and that from Manchuria takes up the major portion.

II. Outputs of Manchurian Beans.

Manchuria is, so to speak, cut out by nature as bean producer. Together with kaoliang, Beans make the two foremost articles of staple produce to Manchuria, which are known all the world over.

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In the absence of authentic statistics, which is one of the general drawbacks in China, nothing approaching an accurate estimate of the annual production of Beans in Manchuria can be had, except the "Agricultural and Commercial Statistics of China," as published by the Peking Government, which has gained a notoriety rather for its inaccuracy.

Therefore, in order to get an approximately correct estimate, the only way left is to draw an inference from the weather conditions, export amount, arrivals at the markets, etc.

Under such circumstances, it seems only natural that the data on this same subject, as given by different parties, are very widely apart.

The following are what may be presumed as the more reliable :—

(A) According to returns gathered by Government General of Kwantung in March, 1916: Manchuria and Mongolia Industrial Manual, p. 43–50:

Province	Chinese *koku*
Fengtien	7,582,405
Kirin	4,115,036
Heilungkiang	2,144,083
Total	13,841,524

(B) According to statistics compiled by General Staff Office for 1920:

Province	Japanese *koku*
Fengtien	10,574,000
Kirin	6,811,000
Heilungkiang	3,204,000
Total	20,679,000

(C) According to Mr. K. Nomura (formerly of the S. M. R. Co.) in "Sketch of Manchuria and Mongolia," p. 19:

Province	Cultivation area *hiang*	Outputs Chinese *koku*
Fengtien	1,035,400	6,182,400
Kirin	784,100	3,897,400
Heilungkiang	360,500	1,030,200
Kwantung Leased Territory	60,000	150,000
Total	2,240,000	12,010,000

Note: 1 *hiang*, although subject to variation according to places, is equivalent to about 1858 *tsubo*.

1 Japanese *koku* is equal to 4.63 bushels;
1 Chinese *koku* is equal to 6.019 bushels.

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In our own opinion, the aggregate outputs of the three Eastern Provinces may be placed roughly at 18,800,000 Japanese *koku*, being the sum total of the following:—

Aggregate estimated outputs at the end of 1920.

Province	Cultivation area *tsubo*	Japanese *koku*
Fengtien	2,853,450,000	8,869,800
Kirin	1,778,940,000	4,918,800
Heilongkiang	1,643,280,000	4,961,500
Total	6,275,470,000	18,750,100

Of the above outputs, the author puts what is for domestic consumption as seed-beans, food stuff, cattle-feed, oil making material, etc., at about 3,092,000 *koku*, leaving the balance of about 15,658,100 *koku* for the purpose of business, mostly for export.

III. Beans as Oil Yielding Agent.

From time immemorial, the Chinese have been making oil for edible purposes from Beans. Their use as oil yielding agent in the West is an event of only recent years.

In 1908, both hemp and cotton crops failed generally in the West, and the British oil manufacturers were at a loss how to supply the serious deficit. This opportunity was snatched by Messrs. Mitsui & Co., Japan, who sent trial shipments. They were welcomed enthusiastically, and as the result, the total amount of Beans imported to Great Britain reached nearly 4[illegible] tons, which will attest to the great popularity Manchurian Beans enlisted.

Then, in the United States, attention has been turned to Beans as oil-making material during these dozen years or so, and technical experimentations and tests are being conducted at a great number of agricultural experimental stations and oil mills.

For instance, at a Delaware experimental station, forty-eight varieties of Beans have been used as subjects of years' study as to oil percentage, quality of oil, how to extract oil, extraction percentage, etc. (*vide* Soy Bean Oil (p. 6) Delaware Experiment Station).

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By the side of such a proof of zeal, even the Japanese and the Chinese, who are really seniors in Bean industry, will be thrown into the background.

However, in the United States, it is after 1914 that bean milling enterprise has risen to be an independent business venture (*vide* Report of an official of the Bank of Chosen sent abroad. p. 14, No. 1, 1919).

To show what place is assumed by Beans as oil-giving agent, the constituents of Beans, linseed, and cotton-seed are compared below :—

	Beans	Cotton-Seed	Linseed
Oil	17.2	19.9	33.7
Albumen	33.5	18.4	22.6
Non-nitrogenous matter	28.3	24.7	23.2
Fibre	4.5	23.2	7.1
Ash	4.8	3.5	4.3
Water	11.7	10.3	9.2

As indicated above, Beans come after both cotton-seed and linseed in oil percentage ; but Bean Cake, its bye-product, commands quite a fair price as manure and cattle-feed, and of late it is coming to be recognized to have a good claim as a food stuff, rising in its market value in consequence.

On this account, the bean mills attach great importance to generally Beans, but, on rare occasions, to Bean Cake, when the latter's quotation goes up sufficiently.

In order to determine the value of Bean Cake as cattle-feed, the table of analyses prepared by Mr. Wolf regarding several oil-yielding materials is given under :—

	Bean Cake	Cotton-seed oil residue	Linseed oil residue	Rape-seed oil residue	Sesamum oil residue
Albumen...	4.03	24.7	29.5	31.6	36.0
Fibre	5.5	24.9	9.1	11.0	8.1
Soluble non-nitrogenous matter ...	28.1	26.0	29.9	29.9	22.4
Oil	7.5	6.0	9.6	9.6	11.9
Water	13.4	10.6	12.2	11.3	11.1
Ash	5.2	7.2	8.8	7.1	9.9
Digestible albumen	38.3	18.0	24.8	25.3	31.1
Digestible non-nitrogenous extract.	20.4	18.7	27.5	23.8	22.0
Digestible oil	0.8	5.9	8.9	7.7	10.7
Nutriment %	1.3	1.6	2.0	1.7	1.6

The above table will show at a glance how Bean Cake contains a larger percentage of albumen than any other kind of residues. It is moreover said

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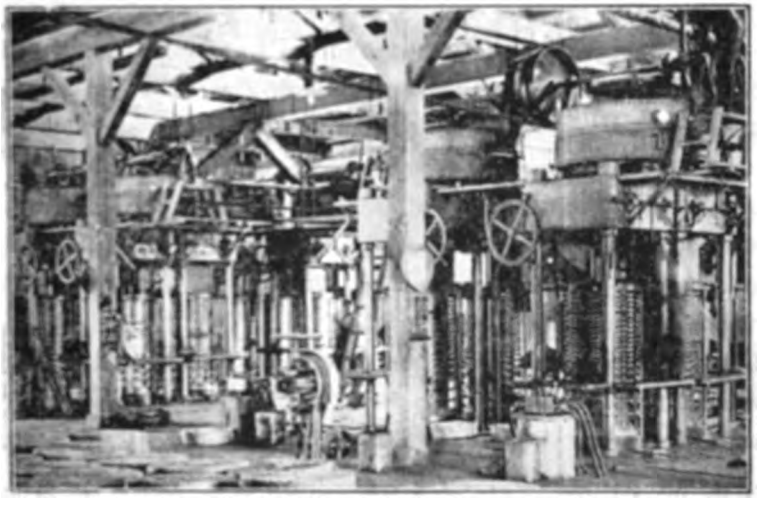
in favour of Bean Cake that has always manifested a decided liking for Bean Cake, compared with the other kinds. A member of the party who visited Manchuria in summer of 1921 in order to investigate matters concerning Manchurian horses in the interest of the War Office, Tokyo, was heard to remark that, for portable fodder, a mixture of Bean Cake and Italian millet was the best and handiest to carry.



Hydraulic Presses in Nanlun Oil Mills, Dairen.

Next, comparing the fertilizing properties of Bean Cake and allied residues, the following table will indicate that Bean Cake is superior to other residues in potassium and nitrogen percentages, though inferior in phosphoric acid percentage :—

	Water	Organic matter	Nitrogen	Phosphoric acid	Potassium
	%	%	%	%	%
Bean Cake	12.7	83.4	6.75	0.70	2.40
Cotton-seed oil residue	11.2	82.2	6.21	3.05	1.58
Rape-seed oil residue	11.3	83.0	5.05	2.00	1.30
Sesamum oil residue	11.1	79.6	5.86	3.27	1.45
Linseed oil residue	12.2	82.7	4.72	1.62	1.25
Peanut oil residue	10.4	85.0	7.56	1.37	1.50

The above table is quoted from p. 559, on "Fertilizer" by Mr. N. Yoshimura.

It will do well to mix phosphoric acid manure in a suitable quantity with Bean Cake when it is to be applied.

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Next, we shall proceed to see what percentage of oil in Beans permits of being expressed or extracted out of Beans.

In foreign countries, obtaining from 50 to 60% of the total oil in Beans is claimed to be not very difficult by means of ordinary expressing method. (*vide* Soy Bean Oil, p. 5).

Again, according to a report by Mr. Brode, by the use of the method of extracting the oil by means of catalyzer, as in vogue at the leading oil mills in Great Britain, more than 90% of the total oil may be available. It is probable that the catalyzer is no less an article than benzine.

Turning to the local returns, the expression of 50 *kin* of Beans yields 4.7 *kin* of oil (4.8 *kin* to 4.5 *kin* according to the Nisshin Oil Mills, Ltd., one of the most influential plants at Dairen), besides a piece of Bean Cake weighing 46 *kin*.

Now, putting the average oil percentage in Beans at 17%, 50 *kin* of Beans may be considered as having 8.5 *kin* of oil. If 4.7 *kin* of oil can be obtained from this, it will correspond to about 55%.

By chemical extraction by the use of benzine, 13 *kin* of oil and 80 *kin* of bean meal are obtainable from 100 *kin* of Beans. By the same method of calculation, the above means some 77% of the whole oil that may be extracted.

Next, the oil percentages obtainable and left in the residue are as under, according to p. 32, "Manchurian Beans" by Mr. B. Ito, of the South Manchuria Railway Company:—

	Average of oil mills in Manchuria (expressed by hydraulic pressure & giving Bean Cake) Maximum pressure per inch surface space	Kabalkin Bean Mill, Harbin (expressed by hydraulic pressure & giving Bean Plate) Maximum pressure per inch surface space	Suzuki Bean Mill, Dairen. (Worked by chemical extraction)
	600-700 lbs.	1,700-2,000 lbs.	
Oil % to Beans ...	...9.0-10.0%	11.5-12.5%	14.0-15.0%
Oil % left in residue ...	7.0-9.5%	5.0-7.0%	2.5-3.0%

The chemical extraction method is by far the most advanced, but it requires a most complex mechanical installation which will fix considerable capital. In addition, by the rise of benzine in price, the producing cost will be increased, sometimes threatening to make the enterprise anything but paying.

As to the kinds of Beans that will contain the highest quantity of oil, which no doubt must be a matter of the keenest interest to all concerned directly or

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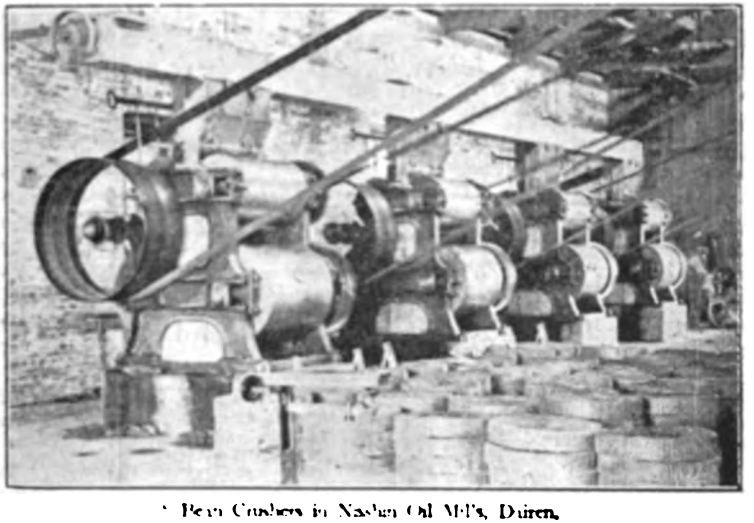
indirectly in Beans, there are several ways of judging, among which the one outlined by Mr. Y. Nakamoto, as a result of his careful study of 103 kinds of Manchurian Beans for several years, gives the undermentioned hints :-

Irrespective of sizes of grains, such as (1) have a strong blue shade in the yellow ground of colour, (2) are lustrous, (3) are of spherical shape, (4) have cotyledons of the deepest colour, and (5) have the eye of grey or light black colour are concluded as containing a high oil percentage.

IV. Outputs of Manchurian Bean Oil.

In Manchuria there have been oil mills on small scales scattered here and there. Once the true value of both Bean Oil and Cake has become recognized by people at home and abroad, mills of ever newer stages have come into being at different points, and now there are few places, where communications facilities exist and Beans are distributed in a decent amount, but have any bean mills.

The very name of Manchuria now associates itself with bean mills, and Dairen, Yingkou (Newchwang), Liaoyang, Kaiyuan, Antung, Harbin, etc., are the greatest bean milling centres.



Bean Crushers in Nachan Oil Mills, Dairen.

The major portion of oil got out is exported to Europe and the United States, and the bulk of Bean Cake and Meal to Japan and South China.

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The following gives a table of bean mill statistics :—

	Number of mills	Daily producing capacity of Bean Cake piece	Total annual outputs in 1919 Bean Cake piece	Bean Oil *kin*
Dairen	60	118,700 160,000 *kin* bean meal	27,934,000 32,390,000 *kin*	136,553,000
Chinchou	1	25	9,700	45,500
Sanshihlipu	2	265	15,060	70,000
Pulantien	4	580	106,450	500,000
Wafangtien	7	2,530	607,200	2,853,840
Telissu	4	600	158,400	744,480
Sungshu	6	2,040	450,600	2,117,820
Wanchialing	1	15	2,700	12,690
Hsuchiatien	2	60	10,800	50,760
Chiuchai	3	45	9,450	44,410
Hsingyocheng ...	6	540	74,500	350,150
Luchiatun	2	50	10,200	47,940
Kaiping	4	340	68,000	319,600
Tashihchiao	3	240 (small)	50,000	137,500
Yingkou	21	31,200 pieces (large) 5,300 ,, (small)	7,260,000 1,110,000	30,464,500
Haicheng	8	400 ,, (large) 700 ,, (small)	80,000 140,000	761,000
Nantai	2	220 ,, (small)	44,000	121,000
Anshan	1	50	15,000	78,500
Lishan	1	400	84,000	394,800
North Shaho	2	160	2,888	13,500
Linoyang	22	6,150	922,500	4,335,750
Yentai	2	500	75,000	352,500
Shaho	1	250	40,000	188,000
Fushun	10	1,310	218,800	1,028,360
Fengtien(Mukden)...	11	407	171,500	806,050
Hsintaitzu	5	575	160,000	752,000
Tiehling	8	3,328	947,000	4,450,900
Kaiyuan	14	17,450	3,028,000	14,231,600
Saupingkai	2	800	174,000	817,800
Lialu	9	780 small	140,400	386,100
Pansencheng	10	1,200 ,,	214,000	588,500
Chengchiatun	13	840	151,200	710,640
Kungchaling	3	1,000 120 small	122,705 11,200	607,790
Fanchiatun	1	600 ,,	100,000	275,000
Changchun	12	180 2,700 ,,	unknown	unknown
Penchihu	5	5,800	15,800	74,200
Antung	18	15,100	3,505,000	16,396,500
Harbin	24	33,020 (small) 6,200 pieces (plate produced at Kalsakun Mill)	9,838,900 (small) unknown (as to Kalsakun mill)	18,800,970
Total	310	208,500	40,520,505	240,084,800

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	45,840 (small)	8,647,500 (small)
	160,000 *kin* bean meal	32,390,000 (in bean meal
	6,200	unknown
	(in bean plate just out at Kaiaikan,	(as to Kaiaikan Mill)

Note: The above table has been quoted from p. 34, "Manchurian Beans."

According to the same table, the city of Dairen had 60 bean mills which produced amongst them 136,553,000 *k.n*, which defies all comparison.

Outputs for 1920.

The total outputs of the Dairen plants for the fiscal year 1920 amounted to 25,719,000 pieces Bean Cake, 2,994,000 *kin* Bean Meal, and 121,366,000 *kin* Bean Oil.

The first mill founded at Dairen was the Chinese mill named the Shuanghochan at Hsiaokangtzu (Chinese Quarter) in December, 1906.

In 1908, what was known as the Specific Freight Tariff to the Seaboard Ports was introduced by the South Manchuria Railway Company, and this worked to boom the port of Dairen as import and export port at the expense of Yingkou.

According to Mr. R. Ito, of the S. M. R. Co., the rapid development of the bean milling industry at Dairen is owing, in addition to (1) the natural accumulation of Bean stocks at Dairen in consequence of the operation of the above mentioned Specific Freight Tariff, to (2) the excellent wharfing appointments installed at Dairen which is an ice free port: (3) a well organized financing system maintained at Dairen; and (4) the perfect police service of Dairen which guarantees the security of life and property far better than at any of the interior towns.

V. Exports of Manchurian Bean Oil to United States.

The best part of Bean Oil produced in Manchuria is exported to South China, Japan proper, the United States, and Europe, the figures for the three ports of Dairen, Yingkou, and Antung in the recent years being as follow:—

a) Dairen.

	To					
	United States	Japan	Europe	China	Elsewhere	Total
	Tons	Tons	Tons	Tons	Tons	Tons
1915	4,805	21,872	45,702	5,289	72	77,843
1916	30,167	29,357	45,043	968	8	105,080
1917	136,528	20,308	800	1,642	2	159,280
1918	203,735	5,060	75	401	4	209,275
1919	65,665	39,188	70,283	8,348	31	183,515
1920	50,228	24,443	82,545	10,265	57	167,538

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(b) Yingkou.

	To			
	Japan Piculs	China Piculs	Hongkong Piculs	Total Piculs
1917	603	8,154	—	8,757
1918	1.884	171,852	1,139	174,875
1919	98,521	139,541	—	238,062

(c) Antung.

	To			
	Japan Piculs	Chosen Piculs	China Piculs	Total Piculs
1917	964	2,086	40	3,090
1918	8,814	19,869	3,785	32,468
1919	2,544	9,873	23,599	36,010

As may be seen from the above, the exports from the United States and Europe are shipped via Dairen almost wholly, and there is a tendency of steady increase in volume. The trade with the United States in particular increased ten and half times in the course of only six years from the fiscal year 1915 to 1920.

Below a table is appended, showing the rate of increase in the export trade with the United States, that passed through the port of Dairen, starting from the fiscal year 1915, with comparative data for a few other countries:—

	To			
	United States	Japan	Europe	China
1915	1	1	1	1
1916	0.25	1.34	0.99	0.18
1917	28.44	0.93	0.02	0.31
1918	42.44	0.23	0.02	0.08
1919	13.08	1.79	1.54	1.58
1920	10.40	1.12	1.81	1.94

During the great War, the Allies took to importing a great quantity of Bean Oil from Manchuria and Japan with the object of manufacturing glycerine as material for gun-powder. But, owing to the Indian Ocean, the Mediterranean Sea, etc., having been infested with German submarines to the terrible menace of the Allied merchantmen, the Allies came to draw the necessary supply via the United States. This explains why the exports to Europe sharply decreased in the fiscal years 1917 and 1918, whilst the business with the United States increased rapidly.

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The following shows the percentage of exports to the United States, compared with the whole export trade via the port of Dairen: —

Fiscal year	Exports to U. S. A. Tons	Whole export Tons	Former's percentage to latter
1915	4,810	7,803	62%
1916	30,167	105,080	29%
1917	136,528	159,280	86%
1918	201,735	293,275	67%
1919	65,665	183,515	36%
1920	50,228	167,538	30%

Then, the major portion of Bean Oil exported to Japan is exported to Europe and the United States from Kobe, Yokohama, Osaka, Nagasaki, etc.

The following gives an extract from the statistics prepared by the Ministry of Agriculture and Commerce, Tokyo, concerning the exports from Japan: —

	Cwt.	Yen
1917	5,524,746	¥1,248,205
1918	4,028,218	1,514,142
1919	2,030,010	803,103

Exports from Japan to United States.

According to the Japan Foreign Trade Manual

	Piculs	
1917	52,514	¥1,187,000
1918	38,443	1,205,000
1919	14,017	484,000

For reference sake, the details of Bean Oil put out in Japan are given under: —

According to the statistics compiled by the Ministry of Agriculture and Commerce:

	Cwt.	Yen
1915	79,088	¥ 2,025,470
1916	119,015	4,084,368
1917	154,528	7,623,402
1918	147,188	10,705,187
1919	185,809	13,323,778

It may be stated that, as material for above, Manchurian Beans formed the bulk.

A good deal of Manchurian Beans was shipped to the United States via Vladivostok, although the data concerning the same are not available. Again, some more was re-exported also to the United States from Hongkong, Shanghai, etc.

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Next, the imports into the United States of Manchurian Beans may be shown under :—

From	1916	1917	1918	1919
Japan	5,471,911 lbs.	70,384,049 lbs.	67,169,454	86,830,581
	$252,375	3,749,581 ,,	4,623,384	4,623,383
Kwantung Leased Territory	9,665,000 lbs.	12 787,500 lbs.	82,320,382	237,332,917
	$443,224	$682,507	$5,824,067	23,104,484
China	3,072,811 lbs.	14,685,790 lbs.	12,911,549 lbs.	12,470.720 lbs.
	$137,727	$677,252	$944,938	$1,456,182
Tsingtao	80,665 lbs.	—	—	74,000 lbs.
	$3,591	—	—	$10,811
Hongkong	—	905 lbs.	—	675 lbs.
	—	$22	—	$92
British India... ...	—	73,630 lbs.	—	—
	—	$4,900	—	—
Great Britain ...	906,134 lbs.	187,722 lbs.	10,130 lbs.	—
	$62,902	$13,933	$1,098	—
Canada...	—	—	287,720 lbs.	—
	—	—	$17,120	—
Jamaica	—	—	—	5,751 lbs.
	—	—	—	$ 900
Total Quantity	10,206,521 lbs.	98.119,695 lbs.	162,690,235 lbs.	336,824,646 lbs.
Total Value ...	$890,819	$5,128,200	$11,410,600	$32,827,400

Channels of Import.

The largest portion of Bean Oil imported into the United States from Dairen passed through Seattle; next came San Francisco. From each port of landing, it was shipped away in tank cars to such industrial States as Wisconsin, Illinois, Indiana, and Michigan having Chicago for the centre, and also to New York and other industrial centres in the East.

The more influential consignees keep private oil tanks provided for them at Chicago, New York, etc., and, in ordinary circumstances, the oil is pumped out of the tanks direct to the factories, although, at times, the oil is left in these tanks for a while from the consideration of the market quotations.

Principal Dealers.

The Mitsui Bussan Kaisha, Messrs. Suzuki & Co., the Nisshin Oil Mills, Ltd., etc., are among the principal dealers at the Dairen end: while at Seattle, Messrs. Rogers, Brown & Co. dealt direct with Dairen; at Chicago, Messrs. Swift & Co. are the heaviest buyers; and at New York, the majority of dealers in cotton-seed oil were interested in import Bean Oil. Again, dealers on the Produce Exchange are said to be also commission merchants dealing in Bean Oil.

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Then, many factory managers buy Bean Oil direct.

The following table giving the chief consumers, dealers, and commission merchants at the different centres in the United States, as prepared by an official of the Bank of Chosen, may be of much interest :—

Importers and Commission Merchants.

New York City.

Manchurian Bean Oil	
Aberdeen Chemical Company.	200 Broadway.
W. G. Agar & Co.	25, Beaver Street.
American Cotton Oil Co.	65, Broadway
Aspegren & Co.,	Produce Exchange
Balfour, Williamson Co.	43, Exchange Place.
Rutger Bleecker & Co.	87-89 Wall Street
Frederick Boehm, Ltd	165, Broadway
Bowring & Co.	17, Battery Place.
Bower Oil Co., Inc.	29, Broadway.
B. Brown, Inc.	237, Water Street
N. B. Cook Oil Co.	148, Front Street
Cotton & Co., Inc.	37, Liberty Street.
Halle Perrin Trading Corp.	24, State Street.
Sigmund, Kramer.	71, Wall Street.
Marden, Orth & Hastings Corp.	61, Broadway.
Rockhill & Victor.	22, Cliff Street.
William H. Schiel.	159, Maiden Lane.
Chas. T. Stork & Co., Inc.	154, Nassau Street.
Eugene Suter.	120, Broadway.
Alden S. Swan & Co.	135, Front Street.
J. Telenga Export & Trading Corp.	Singer Bldg
Welch, Holme & Clark Co.	381, West Street.
The Williams Commission Co.	25, Beaver Street
J. Early Wood, Inc.	21, Platt Street.
Wright Faber & Co., Inc.	43, Exchange Place.
C. P. N. Chemical Company, Inc.	80, Reads Street.
Dill Crosett Inc. of New York	45, John Street.
Edgertyn Aniline Corp.	118, William Street.
Elbert & Co.	71, Wall Street.
J. C. Francescoui & Co.	25, Beaver Street.
Frank Frost, Inc.	75, East 26th Street.
Frost & Cundill, Inc.	60, Wall Street.
Chas. F. Garrigues Co.	80, Maiden Lane.
L. C. Gillespie & Sons.	8, Fletcher Street.
Lasker & Bernstein, Inc.	161, William Street.
Simon M. Goldsmith.	62, William Street.

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Brooklyn, New York.

Manchurian Bean Oil.	
Knickerbocker Chemical Supply Co.	2065, East 13th Street.

Chicago, Illinois.

Rogers, Brown & Co.	Insurance Exchange Building.
Davidson Commission Co.	520, Postal Telegraph Bldg.
L. C. Doggett Co.	53, W. Jackson Boulevard.
John C. Murray Co., Inc.	11 South La Salle Street.
Swift & Co.	

Seattle, Washington.

Rogers, Brown & Co.

Los Angeles, Cal.

Globe Train & Milling Co.

Cleveland, Ohio.

E. R. Smead Co.

Kansas, Missouri.

W. C. Kinsella.

Rules for Regulating Business.

The Rules laid down for regulating business among members of the New York Produce Exchange in Oils, waxes, and fats, are extracted under:—

Soya Bean Oil.

Sec. 8.—Fair average quality, crude, shall be oil obtained from the Soya Beans by pressure, not extraction, and shall be fair average quality of the season, provided, however, that the Free Fatty Acids shall not exceed 2% (calculated as Oleic Acid), nor Moisture and Impurities one half of 1%.

Sec. 9.—Prime Crude Soya Bean Oil shall be free from water and settlings, and shall refine to a colour not deeper than 35 yellow and 9 red, and with a loss not to exceed 5% with the use of Caustic Soda. If not prime, buyers may reject.

Sec. 10.—Crude Soya Bean Oil, sold "Basis 7% refining loss," shall be free from water and settlings, and refine to a colour not deeper than 35 yellow and 11 red, and with a loss not to exceed 7% with the use of Caustic Soda, provided that any oil that refines with a greater loss than 7% shall be rejected, but price shall be adjusted per Rule 8, Section 1.

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Sec. 11.- Extracted Soya Bean Oil shall be sold on sample or guarantee with the designation of the country of origin.

The above rules are provided, but in fact, even the domestic products, not to mention imports from abroad, have been known to fail to pass muster.

A cry has often been heard among the domestic and foreign dealers against leaving in operation any such rules as attach too exacting importance to the quality of Bean Oil, and hardly answer practical purposes. They are bitter, saying that their retention in effect is not conducive to the fostering of the business.

Consequently, as regards business in Bean Oil, it is growing more difficult to utilize the Produce Exchange, and the importers are working for the sale of their Bean Oil direct to the consumers. As to quality, bargains are being closed merely as "average crude."

Market Fluctuations.

How the market quotations on Bean Oil are being influenced by those of cotton seed oil and linseed oil may be traced by a perusal of "Commercial Reports, Vegetable Oil and Oil Seed" of the "Economist."

At Dairen, the quotations in the latter part of July, 1922, stood at S.Y13.50 per 100 *kin*, Y1 higher than about the middle of the month. Speaking of imports to Japan, the price would be C.Y16.50 f.o.b. Kobe, whilst Bean Oil produced in Japan was quoted at Y16 (from Trade Report of the "Osaka Mainichi Shimbun" on July 31st, 1922).

VI. Quality of Bean Oil.

Before proceeding to enlarge upon the utilities of Bean Oil, a review of its physical properties may be of use.

Bean Oil is a liquid of pale yellowish brown and has a somewhat disagreeable smell (which is held by a few people as quite to the contrary). By refining it, a fine edible oil of a pale amber hue is obtainable. If kept at 0° C. for a long time or at 7°-8° below zero for about an hour, it will crystallize out a coagulated matter, and will get completely frozen at 17° below zero, readily soluble in ether, petroleum ether, carbon bisulphide, chloroform, etc.

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The following is the indices (or properties) for Bean Oil :—

Specific gravity	Saponification value	Iodine value	Hehner value	Refractive value	Observers
(15°) 0.9256	192.62	130.70 (Hubl) 132.50 (Wijs)	95.7	(20.6°) 1.4755	Tsujimoto
(15°) 0.9243	192.40	134.4 (Wijs)	95.2	(20°) 1.474	Nishiyama
(15) 0.9205	190.00	132-135 (Hubl-Waller)	94.2		Keimatsu
(15°) 0.9206	191.95	120.77	—	—	Holland
(15°) 0.9270	192.9	122.20			Morowski & Stingle
(15°) 0.9242	192.5	121.3			De Negri & Fabris
0.9240	190.6	124.0			Shukoff
0.9193	187.27	129.72			Morgan
0.9200 } 0.9300 }	193.19	133.141			Central Laboratory
0.913	187.27	129.72			Delaware Agricultural Experiment Station

More or less variations in figures are noted in the above table, but these discrepancies may be ascribed to the difference in the method of obtaining the oil and also the use of Beans grown in different climates and soil.

Next, what may be termed "mixed sample" was once made at the Delaware Agriculture Experiment Station, U. S. A., by mixing an equal amount of each of the different kinds of Bean Oil manufactured by the same method from altogether 48 different kinds of Beans.

The indices (or properties) of the mixed sample above mentioned are as under (Soya Bean Oil, p. 7) :—

Specific gravity (15°)	0.9212
Saponification value	188.65
Acid value	0.28
Reichert Meissl value	5.3
Hehner value	93.50
Neutralization value	177.82
Iodine value	127.78
Iodine value of unsaturated fatty acid	131.93
Unsaturated fatty acid	84.70
Saturated fatty acid	8.61
Ether value	188.37
Glycerol	10.29
Average molecular weight	315.5

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Indices to the above Table.

a) Specific gravity was observed by means of an ordinary hydrometer.

b) Saponification value indicates in milligrammes the caustic potash necessary for saponifying 1 gramme of Oil.

c) Acid value denotes in milligrammes the caustic potash required for neutralizing free fatty acid contained in 1 gramme of Oil.

d) Reichert Meusl value denotes in cubic centimetres the caustic potash of 1/10 degree of concentration required for neutralizing the fatty acid in the volatile oil obtained by Reichert's distillator from 5 grammes of oil.

e) Hehner value indicates the mean value giving the sum of the insoluble fatty acid and the non-saponifiable matter. However, under this item, a foot note is appended to the effect that, since the non-saponifiable matter contained matters which have not been detected, the figure indicates merely the quantity of the insoluble fatty acid.

f) Neutralization value denotes in milligrammes the caustic potash required for neutralizing 1 gramme of mixed fatty acid.

g) Iodine value indicates the mean value of iodine chloride. If the iodine value is high, it shows that much unsaturated acid is contained, whilst, if otherwise, it shows a low saturation degree.

Other properties may be set forth:

a.) When Bean Oil is heated and has air blown thereinto, both specific gravity and viscosity are observed to increase. This is called "Blown-In Oil."

b.) When boracic acid of manganese or resinate of manganese are applied to Bean Oil to make boiled oil, the Boiled Oil will get dry within twenty four hours. Put the drying Bean Oil in a thin layer on a piece of glass and heat it up to 100° in a current of air, it will become mucilaginous in two hours and will form a dry film in four or five hours.

(For further particulars, reference is invited to p. 163, the "Japanese Vegetable Oils" by Mr. M. Tsujimoto).

Below is given a table making a comparison of the properties of a few kinds of vegetable oils familiar to people:—

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	Specific gravity	Saponification value	Iodine value	Reichert Meissl value	Hehner value
Linseed Oil	0.9316	192	180	0	95
Cottonseed Oil	0.9230	192	108	—	96
Rapeseed Oil	0.9170	175-177	{97-65 / 102.1}	—	{94.56 / 96.3}
Maize Oil	0.9274	191.9	125.9	4.25	92.5
Bean Oil	0.9212	188.6	127.8	5.3	93.5

The above table will point out the notable difference in iodine value, especially amongt he discrepancies between the properties of Bean Oil and Linseed, Cotton-seed-, and rape-seed oil, and also a striking approximateness to those of maize oil.

Therefore, Bean Oil might be looked upon as a semi-drying variety of maize oil. Their approximateness may be confirmed further by the following table :—

	Bean Oil	Maize Oil
Acid value	0.28	2.07
Iodine value	127.78	119.18
Saponification value	188.65	102.65
Ether value	188.37	185.68
Hehner value	93.50	92.51
Reichert Meissl value	5.30	4.25
Glycerol	10.20	10.45

Method of Detection.

Because of the price of Bean Oil being cheaper than any other seed oil on the market, it is seldom adulterated with other kinds of fat.

In the event of some mineral oil having been mixed with Bean Oil, its presence may be easily determined by the detection of the non saponifiable substance.

However, to detect its presence in adulteration with other kinds of fat is a matter of difficulty, simply because Bean Oil is lacking in a property to give a colour reaction or any other peculiar characteristic.

In such cases, the different properties of the kinds of oil to be examined should be observed, and from these results, the presence or absence of Bean Oil might be inferred.

For instance, when Bean Oil is mixed with rape seed oil, the latter's mixture may be detected by the all round rise of the mixture in specific gravity, saponification value, iodine value, refractive value, etc. Still if the rape-seed oil is mixed only in a trifling quantity, it would be very difficult to pass a precise verdict (vide p. 172-173, the Japanese Vegetable Oils).

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VII. Utilities of Bean Oil in U. S. A.

As a general utility of Bean Oil, the Chinese inhabitants use it mainly as edible oil and also as a source of light, (although Bean Oil is rather ill suited for lighting purposes because of its being a semi-drying oil.

The Japanese use it as material for making soap, candles, refined oil, hardened oil, glycerine, some kinds of paint such as solite, tantalus, etc.

In the West, the largest quantity of Bean Oil is employed as soap-making material, and also for the manufacture of paint, varnish, linoleum, water-proof paint, substitute for ebonite, candles, machine oil, oleomargarine, salad oil, oil for packing sardines, glycerine, substitute for lard, etc.

An outline of the chief uses of Bean Oil in the United States is given below :—

A) As Soap-Making Material.

As soap-making material, cotton-seed oil, maize (corn) oil, and cocoanut oil are chiefly used in the United States. Especially, cotton seed oil used to be in the greatest demand, till in recent years, as its need as edible oil sharply increased, coupled with its dearer price, a substitute therefor has come to be sought in Bean Oil. On this account, as soap-making material, the demand for Bean Oil seems to be regulated by its comparative position with the other vegetable oils available for the same purpose, in regard to price.

Bean Oil is somewhat hard to be saponified, and its incomplete saponification will produce a kind of soap, which is susceptible to deterioration, will emit a disagreeable odour, and will show yellowish spots. However, these defects may be remedied by mixture in suitable quantities with tallow, cocoanut oil, resin, etc. Then, soap made entirely from Bean Oill will be found inclined to be of dark yellow and soft. By addition of about 30% of cocoanut oil or tallow, a product of excellent quality of yellow or cream colour may be obtained, although more or less decolouration (to be dark) is said to take place in the course of time. And such as has undergone a good kneading operation will assume an exquisite hue, Then, the hardness of the product may be enhanced by mixing water-glass of a suitable quantity with it. An application of starch will improve the lustre. However,

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from the experiments conducted so far, it is thought difficult to put out a soap of milk-white colour from Bean Oil.

It may be added, however, that Bean Oil soap will give an ample amount of bubbles, can withstand hard water well, and also is good to use in sea-water as well as in fresh water. This last peculiarity is shared with cocoanut oil soap only, but no other kind.

According to Mr. G. Uyehata, who once tested the foaming property of soap in a saline solution of varying degrees of concentration, no effect was observed in the production of foam in a solution of 1-2%, but when the degree of concentration rose to 3-4%, it became rather rough to the touch, although foam was produced all right enough; and when the percentage rose higher above 5%, no foam could be shown at all.

To quote Mr. G. Uyehata about the uses of Bean Oil as soap material, which are the most important:

1) Toilette soap; it is compact and lustrous; foams well; and can withstand hard water; in these respects excelling even tallow.

2) Laundry soap; since cheap price and high cleansing property are the chief assets, the exterior appearance becomes a secondary consideration, and on this account, Bean Oil is suited for the purpose to a T.

3) Potassium soap; an output excellent both in quality and property is obtainable; it admits of ready saponification and the manufacturing process, too, may be effected with ease.

4) Transparent soap; ordinary tallow is mixed with a vegetable oil such as cocoanut oil or castor oil and, by applying alcohol or sugar, it is made transparent.

By the substitution of Bean Oil for either kind of the above mentioned, a product of equal excellence may be procured.

5) Floating soap; it is made by raising many air bubbles in process of saponification so as to lower the specific gravity.

By the use of Bean Oil, a product, having high foaming property and great cleansing virtue, and of good appearance, may be had.

6) Silk refining soap; Bean Oil has a small percentage of solid fatty acid. As it readily dissolves, it is suitable as material for refined soap, although in

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quality, it is not so good as Marseilles soap. Still because of the lower price of material, it may be offered at a more moderate price.

Generally speaking, soda soap made from Bean Oil is of yellow colour, whilst potassium soap wears a dark gold hue and is transparent.

A bye product in the shape of glycerine is to be had in the manufacture of soap at the rate of 90% of soap material and 10% of glycerine, concerning which latter more will be said later on.

B) As Paint-Making Material.

As Bean Oil is a semi-drying oil, its suitability as paint-making material has been discovered.

The paint factories in the United States have hitherto depended mostly on linseed oil for material. As linseed oil is sensitively influenced by the hemp crop conditions in the United States and Argentina (South America), Bean Oil is brought into use when linseed oil is high-priced only.

However, in paint-making, Bean Oil cannot be wholly substituted for linseed oil, the former being available only as a partial substitute for the other. It is said that a mixture at the rate of 75% of linseed oil and 25% of Bean Oil will give a product satisfactory in every respect.

If some suitable drying method is adopted, the percentage of Bean Oil is believed to permit of further increase.

In Manchuria, such patented paints as solite, tantalus, etc., which are made from Bean Oil, have been invented by a Japanese chemist (Mr. T. Suzuki, now of the Anshan Iron & Steel Works).

Moreover, Bean Oil is also used in the manufacture of varnish, linoleum, etc.

C) As Edible Oil.

In the United States, cocoanut oil, olive oil, refined cotton-seed oil, etc., used to serve as edible oils. As these kinds of oils are obtainable only in an insufficient quantity, while they are expensive, the conversion of Bean Oil into an edible oil by refining it has been growing more popular lately.

Bean Oil is good to the Chinese palate, but its peculiar smell has failed to commend itself to the Japanese and foreigners. Lately the way to deodorize it

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has been invented, and on its refining, it is coming into a wider use as edible oil.

It appears in a recent publication that, in Great Britain, the method of removing the odour of Bean Oil completely has been invented and patented.

It is said that in the United States, Bean Oil is not only used for cooking purposes, inclusive of preparation of salads, but also for cooking fish to be tinned and offered for sale.

When Bean Oil is hydrogenated, it becomes a solid matter of milk white colour, and this is reported to be liberally used for making margarine and lard.

The drawback of margarine consists in containing a large quantity of acid and being ready to melt even at a normal temperature.

Still, margarine suits the Western taste, and since it can be had in abundance compared with ordinary butter, and as it is materially cheaper, the market therefor is gradually expanding, and it has a good chance to compete with butter.

Margarine made from cocoanut oil, peanut oil, etc., is of finer quality, but neither need be looked upon as a formidable rival because of its being so higher-priced.

Even cotton-seed oil, which has been regarded as cheaper material for making margarine, is said to be doomed to be slowly crowded out of the market by Bean Oil margarine.

D) Other Uses.

During the great War, the demand for glycerine ran fictitiously high as material for gun-powder. All the participants in the War bent their energies upon coming by an adequate supply.

The immensity of Bean Oil turned to this particular use in the United States was as already hinted at.

Even after the close of the War, the demand for glycerine as industrial material has continued extensive, but in view of its being obtained as bye-product in the manufacture of soap (the rate to be produced being as above stated), it is doubtful if there is much occasion for manufacture of glycerine as principal product.

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Crude glycerine appears a liquid of amber colour having a peculiar disagreeable smell resembling that of sugar. When refined, it turns a liquid, colourless, transparent, and viscous.

In the United States, it rose in price to 63 cts.-68 cts. per lb., and Bean Oil was put to use mainly for glycerine-making.

As the armistice was declared, Bean Oil experienced an abrupt fall in price to 15 cts. per lb. or so, which is supposed to have been pressed down further since the return of peace.

When Bean Oil gets hydrogenated, it becomes hardened and may be separated into glycerine and stearin, which latter is being used for candle-making.

Again, it is used for making machine oil and for adulteration of other oils, although only in a small quantity.

But as the United States has plenty of mineral oil for machine oil, she is hardly likely to make use of a vegetable oil such as Bean Oil in making machine oil. Still, Bean Oil, when mixed with some other machine oil, may get its freezing point remarkably lowered, and on this account, it may be put to this use with advantage.

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MANCHURIA ENLIGHTENING SOCIETY.

Whose Organ the "Light of Manchuria" is

What actuates us in our endeavours to open up Manchuria and Mongolia lies in realizing our ultimate ideal in the enlightenment and development of Manchuria and Mongolia. It will not do only to develop the natural and industrial resources, but the ethical and intellectual culture of the inhabitants must also be carefully husbanded and nourished, so that both mind and matter may be developed in harmony.

The Manchuria Enlightening Society raised its first cry in order to fill a sorely felt need. Its primary mission is to investigate and propagate the truths of the development of Manchuria and Mongolia. We shall studiously refrain from misleading the public by disseminating inaccurate or exaggerated reports, but shall steadfastly adhere to the truth or facts only.

It is urgently important that the truths regarding Manchuria and Mongolia should be made known clearly not only to Japan and China, but also to Europe and America. On this account, the establishment of the Manchuria Enlightening Society is bound to have a serious significance of international character.

If happily, through the establishment and activity of this Society, the truths of the development of Manchuria and Mongolia should become topics of world wide interest, it would not be only an honour to those now actively engaged in developing these regions, but also a matter of congratulation to the world at angle.

We might be permitted to add that the ultimate ideal and desire of this Society are to serve as the herald of all enlightening movements in future, thereby opening a new chapter in the annals of the world's civilization.

What is the Society Like.

a) Office.—The office of the Society is in the Municipal Office Building on Central Circle in the city of Dairen.

(b Society's Work.—The works of the Society include the following :—

1. Publication of the organ of the Society, The "Light of Manchuria."

2. Supply of general information through the Society and by other means, giving the results of such investigations and researches as may be conducted in the interest of the development of natural, industrial, and other resources in Manchuria, Mongolia, and Eastern Siberia.

3. To act as guide to intending investors in general in all kinds of enterprises in Manchuria, etc., and also to undertake any special investigation or research on application by promoters of all kinds.

4. To offer facility to travellers on inspecting visits to Manchuria, Mongolia, Siberia, Chosen (Korea), China, etc., to the end of imparting accurate information and rendering their observations as close to truth as possible.

5. To use all kinds of means in order to propagate the true conditions obtaining in Manchuria, etc., and further to carry on the propaganda work for these regions through the medium of lecture meetings, exhibitions, etc.

6. To compile, publish, sell and distribute books, pamphlets, etc., bearing on Manchuria and Eastern Siberia.

7. To carry on other works necessary for disseminating information on Manchuria, etc., and also for fostering economic enterprises therein.

c) In carrying on the above work, the Society is divided into the following :—

Secretariate,
Research Department,
Publication Department,
Intelligence Department, and
Accounting Department.

d) Any one wishing to join the Society is requested to send in a written application, giving the name and address, accompanied with the

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membership fee for not less than three months paid in advance.

e) The membership fee, entitling the member to a copy of the monthly organ, costs 50 sen (¼ yen) per month and ¥6 per annum.

Remittances.

All remittances to this Society may be made most conveniently and safely to Transfer Savings No. 2850, Dairen. No receipts for the same will be issued, but instead the Society's monthly organ will be sent.

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Baron S. Goto (Mayor of Tokyo), President.

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THE
LIGHT OF MANCHURIA

BEAN CAKE AS CATTLE-FEED, INSTEAD OF FERTILIZER.

By Dr. K. Keimatsu,
ex-Superintendent-General of the S. M. R. Co. Central Laboratory and now Professor of Pharmacology of the Imperial University, Tokyo.

Just at present, the local bean mills are in a pretty hole, owing to the impossible prices of Beans, the material, and Bean Oil and Bean Cake, the products.

Dr. K. Keimatsu (Superintendent General of the S. M. R. Co. Central Laboratory, Dairen) who has resigned his post and accepted the chair of pharmacology in the Imperial University, Tokyo) has made Beans an article of his long special study and has been instrumental directly or otherwise for many valuable scientific inventions, etc., in connection with the utilities of Manchurian Beans.

Dr. Keimatsu's observations on Beans will be found of considerable interest and are as follow:—

There is a hope I should like to leave after my prospective departure. It is about the future of the indigenous industries of Manchuria.

People know well that Beans are the first staple produce of Manchuria. Their total production in all Manchuria is put at about 18,000,000 *koku*, being some two-thirds of the world's outputs. Of this total, what is used as oil making material is placed at some 8,000,000 *koku*. Still, the bean milling industry in Manchuria consists, in a major part, of petty plants founded on small capital during the War time inflation. Most of them, at least, have been following an almost obsolete method, and by the present indications, there is no immediate prospect of any marked improvement being introduced into the manufacturing method, and thus all the mills are commiserating in their common predicament.

Any further continuance of the existing state of affairs might expose the future of the foremost indigenous industry to serious risk. For, foreign investors might appear in our midst to exploit the same line of enterprise, making themselves very hard to compete with.

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What I am anxious to recommend to you for a change is that Bean Cake, the residue left after Bean Oil has been extracted, should be intended for cattle-feed, instead of fertilizer as the case has hitherto been.

This problem awaits an early solution.

Now at Dairen alone, more than 110,000 pieces of Bean Cake are being put out daily, and their chief utility has been as fertilizer in Japan. If they should be made into cattle-feed, the market therefor may be extended from Japan to Europe and America. Actually in the West, where artificial manures are turned out on an extensive scale, both cotton seed cake and linseed cake are being used more popularly as cattle-feed.

I might venture to say that in case of Manchurian Bean Cake being made into cattle-feed for export abroad, the demand therefor will be found quite unlimited, and all the supply Manchuria can give will be taken with avidity.

In order to make an excellent cattle-feed of Bean Cake, the percentages of both oil and water, as retained in Bean Cake, must be lowered. For, live stock will fancy a proteid containing little oil, and, for transportation over great distances or for storage over a long period, the moisture left in Bean Cake must be reduced as far as possible so as to prevent it from getting mouldy. That Messrs. Mitsuis have once failed in the export of Bean Cake abroad was owing to its deterioration in quality from the mildew which it engendered.

How can the oil and moisture percentages be reduced to a desired degree?

The answer is: The prevailing expression method will not do.

If Beans are crushed well, then heated, and subjected next to a strong pressure, more oil as well as moisture will be obtainable therefrom.

Now, we shall have to face the question of machinery that must be installed anew to serve the above mentioned purpose.

What is now in vogue in the United States may be imported. Or else, some new machinery might be manufactured.

This problem has been studied by the S. M. R. Co. Central Laboratory, and it will continue one of the interesting questions for further investigation.

While the installation of bulky and pond-rous machinery may be out of the question on the Central Laboratory premises, at least something of a minor scale may be installed for the inspection of those interested in bean milling.

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This will necessitate the discarding of the old machinery now in use at the mills in Manchuria to be replaced with new machinery. It will mean quite a revolution to them.

As already remarked, the existing conditions, in which the petty mills financed with limited funds buy Beans in competition and sell the outputs also in competition, must be broken up prior to the adoption of the new machinery.

A foreign visitor, after going over the local conditions concerning bean milling, has been heard to remark that the whole thing was hardly worth inspecting specially, and that all that he had learned was at what an infantile and insignificant stage the bean milling industry was grovelling.

Again, there was in fact a scheme set on foot to organize a company on ¥3,000,000 to engage in manufacture of crude Bean Oil, and its products, together with auxiliary enterprises. But the local mill owners were not quite ready to have "new wine put in," retaining "the old wine" with its stale and time-worn senility.

At the Central Laboratory, Beans have been made into flour, which, mixed with wheat flour, has been baked into bread and also made into biscuits. But in both cases, a roughness to the touch remained, making the experiments failures.

From these premises, it is to be heartily hoped that bean milling in the future will be founded with the production of Bean Oil for the primary object and that of cattle feed for the secondary one, and this on a more comprehensive scale, amalgamating a number of minor mills.

In case of some such amalgamation being effected, with the new machinery replacing the existing installation, the question concerning Bean Oil, too, will meet with a natural and happy settlement.

The sharp increase in the export of Manchurian (Soya) Bean Oil more to Europe than to the United States during the War proved only a transient phenomenon. For, the indifferent quality of Bean Oil and the appearance of a precipitate after being transported over great distances made it unpopular and ruined its demand.

However, by the new method, the oil percentage will be increased, and, on the introduction of the Mixed Storage system for Bean Oil, it may be stored in a large tank and may be strained by the use of a pump so that the colour may

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be unified, besides a high grade of quality being maintained, to compare well with vegetable oils of the West. The improvement of quality and the unification of colour is bound to raise the demand on the foreign market.

At the same time, the manufacture of hardened oil, as now carried on by the Dairen Oil & Fat Industry Co., makes another enterprise having great possibilities. The hardened oil of this Company has not yet earned a wide and high reputation, but the Company is now turning out an excellent product. Soap, margarine, glycerine, and several other chemical products are made from hardened oil. Moreover, shipment in the form of hardened oil is far more convenient than in the form of crude oil.

From all these considerations, the future of the Dairen Fat & Oil Industry Co. may be said to be aglow with a bright promise.

At all events; if the staple produce of Manchuria is to be made a commodity having a world-wide demand, some such course as already described must be followed. To reiterate, Bean Cake should be made first for cattle feed and next for fertilizer; the improvement of Bean Oil in quality should be striven for; and by discarding the old stale policy of petty exclusion, an extensive amalgamation of existing bean mills should be effected.

For such will prove the only way to deliver the staple produce industry of Manchuria, which has been brought to, so to speak, a deadlock, out of the gloom which now surrounds it.

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HYGIENE OF SOUTH MANCHURIA.

Capter I. Hygienic Administration.

Its History.

The hygienic affairs of the South Manchuria Railway Area (north of Pulantien on the boundary of the Kwantung Leased Territory) are looked after by the South Manchuria Railway Company.

In order to attend to these affairs, the Sanitary Office is maintained in the Company's General Offices, Dairen, to direct and control the sanitary affairs of the Railway Area.

The sanitary institution of the Company at its inceptive stage was only a trivial one, but it has developed by degrees as it has undergone several reorganizations of the Company's staff.

The Sanitary Office, which constitutes one of the Company's units, is to engage in planning, guiding, and controlling the Company's sanitary affairs, and the details are entrusted to the Company's District Agencies, the Secretaries of the Fushun Collieries, the Anshan Iron & Steel Works, and the Shahokou Railway Workshops. Moreover, the police are to cooperate with the Railway Hospital authorities.

The following indicates what changes have taken place in the Company's sanitary institution:—

Epoch 1. Sanitary Office of the Land Department (Established in April, 1907).
Kwantung Leased Territory under direct control of Sanitary Office.
S. M. Railway Area entrusted to Japanese Settlement Councils (Subsequently to the Company's district agencies).

Epoch 2. Land Section (Revised in March, 1908).
Kwantung Leased Territory under direct control of Land Section (Subsequently under Dairen District Agency).
S. M. Railway Area (under District Agencies).

Epoch 3. Sanitary Office of the Local Administration Office (Revised in May, 1914).
Kwantung Leased Territory—under Dairen District Agency (now looked after between the Dairen Municipality Office and the Dairen Civil Administration).
S. M. Railway Area—District Agencies.

Other Sanitary Institutions. In the Kwantung Government, the Local Administration Investigation Commission has been established to investigate and study

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the different administrative affairs in South Manchuria. Acting on one of the resolutions passed by the same Commission, the Railway Company has established the Regulations concerning the Sanitary Commission in the S. M. Railway Area. The districts under the jurisdiction of the Disctrict Agencies and the Secretaries' Offices of the Fushun Collieries and the Anzan Iron & Steel Works are each made a separate district, for which a sanitary commission is organized of officials of the Railway Company and Police officers to serve as an advisory board concerning sanitary affairs.

Again, in accordance with the resolution of the Local Administration Investigation Commission, health officers are kept at important centres of the Railway Area so as to play at part in the sanitary affairs concerned, and also in sundry examinations regarding the preservation of public health and the prevention of epidemics. At the same time, the Kwantung Government has asked these officers to look after the sanitary police affairs. As a result, hygienic experts have been stationed at the five places of Tashihchiao, Fengtien (Mukden), Changchun, Fushun, and Antung in order to perform the above mentioned function.

Matters looked after by the Sanitary Office (in 1921) are as follow:—

(A) Epidemic Prevention:

1. Matters concerning prevention of the specified infectious diseases.
2. " " vaccination.
3. " " preventive inoculation.
4. " " bacteriological examination.
5. " " Sanitary Commission.
6. " " prevention of tuberculosis.
7. " " prevention of trachoma.
8. " " prevention of rabies.

(B) Preservation of Public Health:

1. Matters concerning removal of night soil, etc.
2. " " waterworks, sewage and other hygienic public works.
3. " " investigation of endemic diseases.
4. " " propagation of sanitary ideas.
5. " " sanitary arrangements for the Company's official residences and offices.
6. " " School hygiene.
7. " " railways, workshops, and mining hygiene.
8. " " periodical medical examination of the Company's servants and examination of subjects for relief out of Mutual Relief Society Fund.

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Chapter II. Various Regulations.

AS IN FORCE IN JANUARY, 1922.

(A) Organization of Company's Staff.

(Extracts)

Art. 1. The Company is resolved into the following:—

Office of President
General Affairs Department
Traffic Department
Commercial Department
Local Administration Department
Engineering Department
Accounting Department.

In every unit above mentioned, officials directly attached thereto may be kept.

Art. 16. The Local Administration Department is resolved into Secretary's Office, Educational Office, Industrial Office, and Sanitary Office.

Clause 2. Educational Office looks after the following matters:—

1. Matters concerning education
2. " " South Manchuria Medical College
3. " " Libraries

Clause 4. Sanitary Office attends to the following matters:—

1. Matters concerning sanitation
2. " " hospitals

Art. 17. The South Manchuria Medical College lies under the direction of the Local Administration Department and looks after the following:—

1. Matters concerning medical college education.

Art. 19. The Central Laboratory belongs to the Local Administration Department and attends to the following matters:—

1. Matters concerning industrial and sanitary experiments, testings, and investigations.

(B) Regulations Concerning Sanitary Committee in S. R. Railway Area.

Art. 1. In order to deal with matters concerning the public hygiene, the Company's District Agency shall each have a Sanitary Committee.

Art. 2. The Sanitary Committee is organized with Chairman and a number of members.

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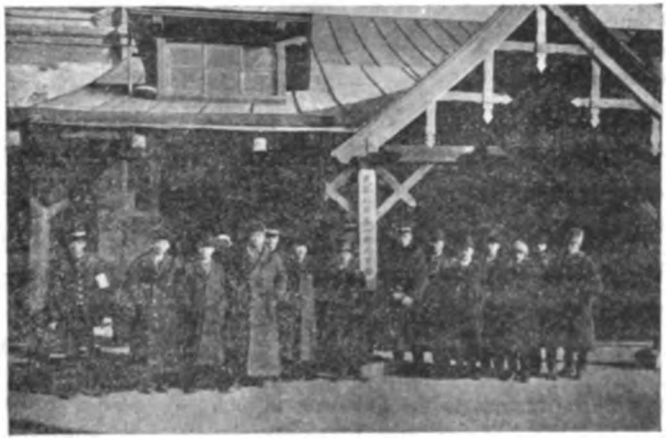
The Company's District Agent shall officiate as Chairman, the other members being nominated by the President.

Art. 3. The President may, subject to the sanction of the Governor of Kwantung, ask the Chief of Police, or the senior police officer, and the sanitary police officer of the district, to sit on the Committee.

Art. 4. The Chairman shall direct the affairs of the Committee and preside at the Committee meeting.



Temporary Quarantine Station, Changchun.
Dr. Tsurumi, fifth from the right.
Chief of Police Li, of Changchun, next Dr. Tsurumi, on the left.

Art. 5. A Committee meeting shall be held whenever the Chairman deems it necessary, or when more than three members of the Committee have asked therefor.

Art. 6. When a Committee meeting is to be held, the Chairman shall report to the President beforehand the date of meeting with the questions to be discussed.

Art. 7. All the decisions adopted at the Committee meeting shall be reported at once to both the President and the Director General of the Kwantung Government.

(C) Regulations concerning Hospitals.

Regulations concerning South Manchuria Railway Company's Hospitals.

Art. 1. The South Manchuria Railway Company shall maintain hospitals and branch hospitals as occasion may require. Their names, locations, and the districts that each is to serve shall be separately fixed.

Art. 2. A hospital may be resolved into divisions when deemed proper.

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Art. 3. A hospital shall be staffed as under, subject to elimination of some at discretion:—

Superintendent-General
Assistant Superintendent General
Superintendent of Branch Hospital
Superintendent of Division (specialized)
Physicians
Head Pharmaceutist
Pharmaceutist
Chief Clerk
Clerks
Artisans

Art. 4. The Superintendent-General shall control the affairs of the Hospital, shall closely follow the sanitary conditions of his medical district, and shall also look over the services of the public physicians.

Art. 5. The Assistant Superintendent-General shall assist the Superintendent-General, and, when the latter is absent from his post, he shall act for his chief.

Art. 6. The Superintendent of a branch hospital shall look after the affairs of the branch hospital under instructions of the Superintendent General.

Art. 7. The officials under the Superintendents of the Divisions (specialized) shall perform their duties assigned to them under the directions of the Superintendent-General of the hospital or the Superintendent of a branch hospital.

(D) Regulations Concerning South Manchuria Medical College.

Section I General Regulations.

Art. 1. This College aims at teaching medical science and solving its mysteries.

Art. 2. This College maintains the Principal Course and the Post Graduate Course.

The former qualifies the student for a physician, whilst the latter guides him in the prosecution of his specialty.

Art. 3. Those in the Principal Course are called students, and others in the Post Graduate Course post-graduates.

Art. 4. A graduate of this College is awarded the degree of "Igakushi of the South Manchuria Medical College."

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Section II. College Term, Annual Term, and Holidays.

Art. 5. The Principal Course runs for 4 years, whilst the Post Graduate Course not less than 1 year.

Art. 6. The Annual Term begins on April 1, each year, closing on March 31 of the following year.

Art. 7. The Annual Term is divided into the following three terms:—

First Term, from April 11 to September 10.
Second Term, from September 11 to January 7 next year.
Third Term, from January 8 to March 31.

Art. 8. The following holidays are observed:—

Sundays, Japanese and Chinese national holidays, and commemorative anniversaries of the College.
Spring Vacation; April 1—14.
Summer Vacation; July 11—September 10.
Winter Vacation; December 29—January 7, next year.

In addition, on special occasions, college will be closed, so long as the total annual class work days do not fall under 200 days.

Section III. Curriculum.

Art. 9. The curriculum of the Principal Course is as follows:—

Curriculum	1st year			2nd year		
	1st term	2nd term	3rd term	1st term	2nd term	3rd term
Ethics	1	1	1	1	1	1
Chinese or Chinese classics	4	4	3	4	4	3
German	10	8	8	8	8	6
Physics (in lectures & experiments)	3	—	—	—	—	—
Chemistry:						
In lectures	6	3	3	—	—	—
Practical training	3	3	—	—	—	—
Anatomy:						
Serial anatomy	12	6	6	—	—	—
Practical training	—	10	—	—	—	9
Topographical anatomy	—	—	—	—	3	—
Embryology	—	—	—	3	—	—
Histology	2	2	—	—	—	—
Experiments in same and use of microscope	—	—	6	—	—	—
Physiology:						
In lectures and experiments	—	4	4	4	2	—
Practical training	—	—	—	—	3	3
Medico-Chemistry:						
In lectures and experiments	—	3	3	—	—	—
Practical training	—	—	6	6	—	—

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Curriculum	3rd year 1st term	3rd year 2nd term	3rd year 3rd term	4th year 1st term	4th year 2nd term	4th year 3rd term
Ethics	1	1	1	1	1	1
Chinese or Chinese classics	2	2	2	2	2	2
German	2	2	2	2	2	2
Physics (in lectures & experiments)	—	—	—	—	—	—
Chemistry:						
In lectures	—	—	—	—	—	—
Practical training	—	—	—	—	—	—
Anatomy:						
Serial anatomy	—	—	—	—	—	—
Practical training	—	—	—	—	—	—
Topographical anatomy	—	—	—	—	—	—
Embryology	—	—	—	—	—	—
Histology	—	—	—	—	—	—
Physiology:						
Experiments in same and use of microscope	—	—	—	—	—	—
Medico-Chemistry:						
In lectures and experiments	—	—	—	—	—	—
Practical training	—	—	—	—	—	—

Curriculum	1st year 1st term	1st year 2nd term	1st year 3rd term	2nd year 1st term	2nd year 2nd term	2nd year 3rd term
Pathology:						
General pathology & Pathological anatomy	—	—	—	8	6	4
Practical training in pathological histology	—	—	—	—	3	3
	—	—	—	—	—	—
Practical training in pathological anatomy	—	—	—	—	—	—
Pharmacology:						
In lectures and experiments	—	—	—	3	3	4
Prescriptions	—	—	—	—	—	1
Practice in preparation of medicines	—	—	—	—	—	1
Hygiene:						
In lectures and experiments	—	—	—	—	—	—
Bacteriology:						
Lectures	—	—	—	3	2	3
Practical training	—	—	—	—	—	—
Interclinique:						
Interclinique	—	—	—	—	—	3
Clinical lectures	—	—	—	—	—	—
Clinical practice with consultation patients	—	—	—	—	—	—
Diagnostics — Lectures	—	—	—	2	2	—
Diagnostics — Practical training	—	—	—	—	2	2

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Curriculum	1st year 1st term	1st year 2nd term	1st year 3rd term	2nd year 1st term	2nd year 2nd term	2nd year 3rd term
Surgery :						
General surgery	—	—	—	/5	4	—
Particular surgery	—	—	—	—	—	4
Clinical practice with consultation patients	—	—	—	—	—	—
Dressing and practice	—	—	—	—	—	—
Surgical operation and practice ...	—	—	—	—	—	—
Kinderclinique :						
Lectures and clinical lectures... ...	—	—	—	—	—	—
Clinical practice with consulation patients	—	—	—	—	—	—

Curriculum	3rd year 1st term	3rd year 2nd term	3rd year 3rd term	4th year 1st term	4th year 2nd term	4th year 3rd term
Pathology :						
General pathology & Pathological anatomy	—	—	—	—	—	—
Practical training in pathological histology	—	—	—	—	—	—
	1	1	1	—	—	—
Practical training in pathological anatomy	on occasion					
Pharmacology :						
In lectures and experiments	—	—	—	—	—	—
Pre-scriptions	—	—	—	—	—	—
Practice in preparation of medicines.	—	—	—	—	—	—
Hygiene :						
In lectures and experiments	—	—	—	—	3	3
Bacteriology :						
Lectures	—	—	—	—	—	—
Practical training	—	—	—	9	—	—
Interclinique :						
Interclinique	3	3	3	3	3	—
Clinical lectures	3	3	3	3	3	3
Clinical practice with consultation patients	3 times a week			3 times a week		
Diagnostics { Lectures	—	—	—	—	—	—
Diagnostics { Practical training ...	—	—	—	—	—	—
Surgery :						
General surgery	—	—	—	—	—	—
Particular surgery	3	3	4	3	3	—
Clinical lectures	4	4	4	4	4	4
Clinical practice with consultation patients	3 times a week			3 times a week		
Dressing and practice	1	1	—	—	—	—
Surgical operation and practice ...	1	2	—	—	—	—
Kinderclinique :						
Lectures and clinical lectures	2	2	2	1	1	—
Clinical practice with consultation patients	—	—	—	3 times a week		

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Curriculum	1st year 1st term	1st year 2nd term	1st year 3rd term	2nd year 1st term	2nd year 2nd term	2nd year 3rd term
Dermatology and Diseases of urinary organ :						
Lectures and clinical lectures	—	—	—	—	—	—
Clinical practice with consultation patients	—	—	—	—	—	—
Rhino-Laryngo-Otology :						
Lectures and clinical lectures	—	—	—	—	—	—
Practical training with consultation patients	—	—	—	—	—	—
Ophthalmology						
Ophthalmology	—	—	—	—	—	—
Use of ophthalmoscopes	—	—	—	—	—	—
Clinical lectures	—	—	—	—	—	—
Clinical practice	—	—	—	—	—	—
Clinical practice with consultation patients	—	—	—	—	—	—
Obstetrics and Gynecology						
Obstetrics	—	—	—	—	—	—
Gynecology	—	—	—	—	—	—
Clinical lectures	—	—	—	—	—	—
Exercises with models in Obstetrics	—	—	—	—	—	—
Clinical practice with consultation patients	—	—	—	—	—	—
Psychiatry :						
Lectures and clinical lectures	—	—	—	—	—	—
Medical Jurisprudence						
Lectures	—	—	—	—	—	—
Dentistry :						
Lectures	—	—	—	—	—	—
Clinical practice with consultation patients	—	—	—	—	—	—
Gymnastic exercises	4	3	2	1	1	1
Total :						
Lectures	42	31	30	42	36	30
Practical training	3	13	12	6	8	18

	3rd year 1st term	3rd year 2nd term	3rd year 3rd term	4th year 1st term	4th year 2nd term	4th year 3rd term
Dermatology and Diseases of Urinary Organ :						
Lectures and clinical lectures	—	—	—	3	2	1
Clinical practice with consultation patients	—	—	—	3 times a week		
Rhino-Laryngo-Otology :						
Lectures and clinical lectures	—	—	—	3	2	1
Practical training with consultation patients	—	—	—	3 times a week		

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	3rd year			4th year		
	1st term	2nd term	3rd term	1st term	2nd term	3rd term
Ophthalmology						
Ophthalmology	2	3	3	—	—	—
Use of ophthalmoscopes	—	—	3	—	—	—
Clinical lectures	—	—	—	2	2	2
Clinical practice with consultation patients	—	—	—	3 times a week		
Obstetrics and Gynecology :						
Obstetrics	2	3	2	—	—	—
Gynecology	2	2	2	—	—	—
Clinical lectures	—	—	—	2	2	2
Exercises with models in Obstetrics.	—	—	—	1	1	—
Clinical practice with consultation patients	—	—	—	3 times a week		
Psychiatry :						
Lectures and clinical lectures... ...	—	—	—	2	2	1
Medical Jurisprudence :						
Lectures	—	—	—	1	1	1
Dentistry :						
Lectures	—	—	—	—	—	1
Clinical practice with consultation patients	—	—	—	—	—	on occasion
Gymnastic exercises	1	1	1	1	1	1
Total :						
Lectures	30	33	33	33	34	35
		not less than			not less than	
Practical training	18	9	9	10	10	9

Remarks : The figures in the table denote the number of class hours per week.

Art. 10. No curriculum is specially prepared for the Post Graduate Course, it being left to the option of the post graduates to make their own choices.

Section IV. Entrance, Suspension, Leaving College, and Dismissal.

Art 11. New students are admitted at the beginning of each annual term.

Art 12. Such as fulfil the following qualifications only are admitted into the 1st year grade of the Principal Course of this College.

Youngmen under 27 years of age, of good conduct and sound constitution, equipped with the undermentioned acquirements :—

a. Graduation through a middle school.

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b. Passage through the examination according to the regulations for the examination of those seeking admission into a college.

c. Such as have completed the Preparatory Course of the South Manchuria Medical College.

d. Such Chinese as are equipped similarly to those mentioned in a or b and also understand Japanese.

Art. 13. When the applicants for admission exceed the required number, a competitive examination may be held over them, and sometimes the selection may be left to the consideration of the College faculty.

Any student of a medical school, Government or public, or a private medical college approved by the Minister of Education desiring to join a grade of the Principal Course higher than the 2nd year, may be admitted when there happens to be a vacancy and he either has passed an examination to be held over him or his admission without an examination has been approved of by the College faculty.

Plague victim carried on stretcher at Isolation House for Coolies, Changchun.

Art. 14. Those who may join the Post Graduate Course shall be either graduates of the College or those similarly equipped, or such as have been considered as suitable by the Faculty.

Art. 15. Any one wishing to join the Post Graduate Course shall apply to that effect, naming the special branches of study.

Art. 16. An applicant for entrance shall send in an application in writing as per specified form, accompanied with a record of past schooling, copies of the diplomas of the schools through which he has graduated, or of certificates of

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passage of qualifying examinations, if any, the stated fee for the examination, and a copy of his own photograph, by the appointed date.

In place of the diplomas above mentioned, one certifying that the applicant will graduate from the school by the date of entrance may be used.

With any one wishing to join a grade above the 2nd year of the Principal Course, a certificate by the Principal of the School, in which the applicant is, may be substituted for the diploma.

Art. 18. Any one who has joined this College shall take oath according to the prescribed form.

Art. 19. Any student of this College who has left it or has been expelled therefrom has applied for readmission, he may be admitted into a grade not higher than the one in which he was last, at the time of admitting new students, only when not quite two years has yet elapsed.

Art. 20. Any one who absents himself from class work owing to illness or some other cause shall send in a report to that effect.

Any one, whose absence from illness has exceeded seven days, shall accompany the report with the physician's certificate.

Art. 21. Any student, that has failed to attend to college for more than two months from illness or some other unavoidable cause, may absent himself from class-work for not longer than one year, subject to the permission of the Director.

Art. 22. Any student, who has entered the military or naval service (either in active service or called to the colours for a temporary service) shall be entitled to absence from class-work during the term.

Art. 23. Any student wishing to leave college from illness or any other cause shall send in an application therefor giving his reasons therein, and under joint signatures with the guarantor.

Art. 24. Any student falling under any of the unmentioned heads shall be expelled:—

1. Irregular attendance.
2. Indifferent scholarship which makes the student a hopeless case.
3. Absence from class-work for longer than a year, an exception being made of the case mentioned in Art. 22.

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4. Absence from class-work longer than a month without good cause.

5. Payment of tuition fee or Laboratory experiment fee in arrears for four weeks.

6. Failure to pass the annual examination twice in succession.

Section V. Examination.

Art. 25. Examinations may be held, either oral or written, and there are two kinds of examinations, annual and graduating.

Art. 26. The annual examination is held at the end of the third term over such branches of study as have been learned during the annual term.

In the case of such branches of study as have had their lessons finished in the first and second terms, the annual examinations for such branches of study may be conducted at the end of the term concerned.

The showings earned in the examinations mentioned in the preceding clause shall be announced, together with the others at the end of the annual term.

Art. 27. The annual examination showings are all indicated in number of marks. Each branch of study has 100 for full marks. Such as have earned more than 65 marks on an average, with none of the branches of study being less than 40 marks, shall be pronounced as passed.

Art. 28. Such students as have completed the fourth year of the Principal Course shall take the graduating examination.

The graduating examination is divided into the first and second examinations.

The first examination is held over anatomy, physiology, medical-chemistry, pathology, and pharmacology.

The second examination is held over interclinique and surgery.

As to such branches of study as ophthalmology, obstetrics, kinderclinique, dermatology and urinary diseases, rhino laryngo-otology, psychiatry, medical jurisprudence, hygienics, and bacteriology, the annual examination may be substituted for the graduating examination, and, as regards such branches of study, in which the student has failed to score sufficient in the graduating examination, although enough has been scored to pass the annual examination, the graduating examination shall be held.

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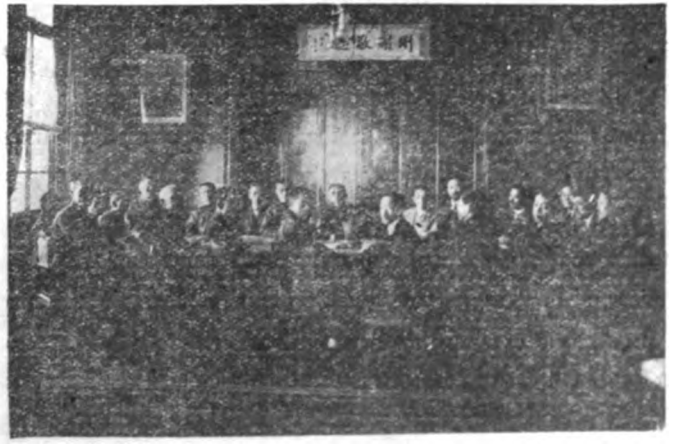
Art. 29. Such as have passed the first examination only shall take the second examination.

Art. 30. In the graduating examination, 100 shall be full marks, and such as have scored not less than 60 marks for each branch of study shall be passed. In respect of one branch of study only, 40 marks will suffice.



Sino-Japanese Plague Conference at Japanese Consulate, Changchun. Consul Murakami on the left of the flowerpot at the centre; District Superintendent Tsai, the spectacled gentleman on the other side of the flowerpot.

Art. 31. If, from illness or some other unavoidable cause, a student cannot be present at the examination, a report shall be sent in to that effect, accompanied with a copy of the medical certificate issued by the physician in case of illness, mentioning the particulars in case of some other cause.

Art. 32. For the sake of any student that has been absent from the examination from some reasonable cause, an auxiliary examination shall be specially held separately, before April 30 in the case of the annual examination, and before December 31 in the case of the graduating examination.

Art. 33. Any student that has not taken either the annual examination or the auxiliary examination, or any student that has not attended class more than one-third of the total number of the class hours for the annual term shall not be passed, unless the Faculty's meeting has considered him to be of superior scholarship.

Art. 34. Such as has failed in the graduating examination shall be subjected to a re-examination with regard to such branches of study as he has failed in.

A re-examination cannot be taken unless six months' time has elapsed.

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Art. 35. All students who have passed the graduating examination shall be awarded diplomas.

Art. 36. When a post-graduate has presented an essay on the subject of his special study, the Director shall nominate an extraordinary committee of judges to report on the merits of such essay, and, when the Committee has considered the essay to have a scientific merit, a certificate shall be issued as per specified form.

Section VI. Tuition Fee.

Art. 37. For the Principal Course, the tuition fee for one term shall be ten yen gold per term, that is, per four months.

No tuition fee shall be charged for the Post Graduate Course. Only, the laboratory experiment fee may be made payable.

Art. 38. The tuition fee shall be paid for each term within the first ten days of the commencement of the term.

Such as fall under the provisions of Art. 22 shall be exempted from the tuition fee during the period of the military or naval service from the next term.

Art. 39. When the tuition fee has not been paid by the appointed date, the delinquent shall be forbidden attendance, and the fee shall be collected from the guarantor.

Art. 40. Neither tuition fee nor laboratory experiment fee already paid shall be refunded under any circumstances.

Section VII. Superior Students.

Art. 41. At the end of each annual term, superior students are selected by the Faculty from among such as are of superior scholarship and exemplary conduct.

Art. 42. Prizes shall be awarded to the superior students.

Section VIII. Discipline.

Art. 43. Such as is of questionable conduct or such as has violated the regulations or orders of the College, or has been guilty of some other disgraceful conduct shall be disciplined.

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Disciplining consists of either reprimand, disciplinary confinement, suspension from classwork, or expulsion from college.

Art. 44. If any of the articles provided for the College is either damaged or destroyed, such article shall be replaced with a new one by the offending student, who is further liable to be disciplined if occasion demands.

Section IX. Regulations Concerning Dormitory.

Art. 45. All the students of the College shall be accommodated in the Dormitory, except where specially permitted to live elsewhere.

Art. 46. The detail regulations concerning the Dormitory shall be fixed separately.

Supplementary Regulations.

For the benefit of the Chinese wishing to join the Principal Course of the College, the Preparatory Course is maintained in the South Manchuria Middle School (for the Chinese) under the title of Medical Preparatory Course.

For Reference.

Regulations concerning Preparatory Course for South Manchuria Medical College (maintained in South Manchuria Middle School, Fengtien (Mukden).

Art. 1. In the South Manchuria Middle School, the Preparatory Course for the South Manchuria Medical College is specially entitled the Medical Preparatory Course.

Art. 2. The Medical Preparatory Course teaches what is necessary for Chinese intending to join the Principal Course of the South Manchuria Medical College.

Art. 3. The term of the Course runs for two years.

Art. 4. The curriculum consists of ethics, Japanese, Chinese, mathematics, natural history, physics, chemistry, drawing, and gymnastics.

Art. 5. The students to be admitted into the Medical Preparatory Course shall be selected by the Director of the College from among those who have completed the third year of the middle school or such as are similarly equipped.

Art. 6. For other than laid down above, the Regulations concerning the Medical College shall apply.

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Section X. Service Regulations of South Manchuria Medical College.

The service regulations of the South Manchuria Medical College as announced in June, 1911, are revised as under, taking effect on and after December 21, 1920.

Art. 1. The South Manchuria Medical College is staffed with the following: –

Director, Professors, Assistant Professors, Secretary, Proctor, Dormitory, Caretaker, Assistants, Clerks, Artisans, and College Physician.

Besides, a Chinese Secretary is kept, the incumbent being the Chinese official as recommended by the Governor of Kwantung Province.

How low class Chinese were accommodated at Dairen Station No. 2, Changchun.
Getting off Goods Car on Set. 9

Art. 2. The Director shall control the affairs of the College and direct and superintend the staff belonging to the College under the President's orders.

Art. 3. Professors shall undertake the teaching and guidance of the students and post-graduates of the College.

Art. 4. The Proctor shall look after the character building of the students.

Art. 5. The Dormitory Caretaker shall assist the Proctor and look after the conduct of the students, and also the affairs concerning the Dormitory.

Art. 6 and 7 deleted.

Art. 8. Assistants shall work under orders of Professors and Assistant Professors.

Art. 9. The Secretary shall attend to general details under orders of the Director.

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Art. 10. The clerks shall attend to the details and accounts under the Secretary's directions.

The Artisans shall perform their duties, as ordered by Professors, Assistant Professors, and the Secretary.

The College physician shall look after the health, and undertake the medical treatment, of the students under orders of the Director.

Art. 11. In case of the services of a competent professor being unobtainable for any branch of study of the curriculum, the Director may appoint some one additionally or engage a lecturer temporarily, subject to the special permission of the President in order to do the required work.

Art. 12. The service regulations concerning the College (Railway) Hospital attached shall be fixed separately.

Section XI. Regulations Concerning Public Physicians.

Art. 1. Public physicians are kept at the principal places along the railway lines and other places where his keeping is deemed necessary. Public physicians are appointed by the President.

Art. 2. The public physicians lie under the control of the Superintendent of the Sanitary Office.

The disposition of the public physicians, together with their respective districts, shall be fixed by the Superintendent of the Sanitary Office, subject to the approval of the President.

Art. 3. A public physician shall reside within the district, to which he has been assigned, and engage in medical practice.

A public physician may be told to undertake a circuit medical treatment of patients within the district assigned to him, when deemed necessary.

Art. 4. A public physician shall look into, and investigate, the sanitary and medical affairs in his district, and shall report on them to the Superintendent of the Sanitary Office.

Art. 5. Public physicians shall attend to the following matters under directions of the Superintendent of the Sanitary Office, except such as have been stationed outside the South Manchuria Railway Area:—

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a) Prevention of epidemics.
b) Investigation of endemic diseases
c) Vaccination.
d) Matters specially ordered concerning public hygeine and medical affairs other than above mentioned.

Public physicians shall perform the duties of the school physicians to the Japanese and Chinese Primary Schools, in addition to the above mentioned matters.

Art. 6. A public physician, when asked to serve the Japanese or Chinese authorities or public organizations, has under obligation to comply therewith.

Art. 7. A public physician and his family may engage in business in medicines or drugs or in any other business.

Art. 8. A public physician shall report to the Superintendent of the Sanitary Office by the 10th of the succeeding month the undermentioned matters handled by him each month:—

a) Matters mentioned in Clause 1, Art. 5
b) Patients treated by him, as tabulated under the different kinds of diseases.

Art. 9. A public physician shall be allowed less than Y100 a month. In case of the local conditions permitting, the house wanted by him may be rented to him by the Company.

Art. 10. A public physician may have instruments for medical and surgical treatment and also for the preparation of medicines rented to him by the Company, subject to a limitation as regards kind and quantity.

Art. 11. A public physician shall keep in stock tools and instruments for ordinary medical treatment, and also medicinal supplies, in addition to the articles rented by the Company, as above mentioned.

Medicinal supply and other articles required for medical treatment may be bought of the Sanitary Office at suitable prices.

Art. 12. When a public physician travels to a point in his district, he may apply to the nearest station master for a pass.

Art. 13. A public physician may fix the consultation fee, surgical operation fee, prices of medicines, etc., within the stipulated tariff of sundry charges of the Company's Hospitals, subject to the approval of the Superintendent of the Sanitary Office.

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Any alteration of the tariff shall be also subject to the approval of the Superintendent, the Sanitary Office.

Art. 14. A public physician shall receive the approval of the Superintendent of the Sanitary Office concerning the undermentioned matters :—

a) When the place of his medical practice is to be shifted to another point in his district.
b) When a hospital or a branch hospital is to be opened.
c) When he wishes to travel on private business.
d) When, from illness or some other cause, he intends to discontinue his medical practice.

Art. 15. All papers that are presented to the Superintendent, the Sanitary Office, by a public physician shall pass through the hands of the Superintendent of the Railway Hospital of his district.

Section XII. Regulations concerning Health Officers.

The Regulations concerning the Health Officers of the South Manchuria Railway Company are established as follow, taking effect from August 1, 1920 :—

Regulations Concerning Health Officers.

Art. 1. Health officers are kept in the Company's Sanitary Office for service at points along the S. M. R. Lines, in order to carry on investigations, study, etc., of sanitary affairs.

Interior of Bacteriological Room, Changchun.

Art. 2. The health officers shall perform the functions mentioned in the preceding article under orders of the Superintendent of the Sanitary Office, in co-operation with the Railway Hospital (or the branch hospital), the District Agency, the Fushun Collieries, or the Anzan Iron & Steel Works.

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Art. 3. The posts of the health officer and the districts assigned to them, are as follow:—

a) Places of posts —
Tashihchiao, Fengtien (Mukden), Changchun, Fushun, and Antung.
b) Districts assigned —
1, Tashihchiao;
District Agencies of Waifangtien, Tashihchiao, and Liaoyang, and the district under the jurisdiction of the Anshan Iron & Steel Works.
2, Fengtien (Mukden);
District Agencies of Fengtien (Mukden), Tiehling, and Kaiyuan.
3 Fushun;
District under the jurisdiction of Fushun Collieries Office.
4, Changchun;
Districts under the jurisdiction of Szupingkai, Kungchuling, and Changchun
5) Antung;
Districts under the jurisdiction of Fenghuangcheng and Antung.

Art. 4. When a health officer submits his opinion concerning sanitary affairs, the report shall be presented through the hands of the District Agent concerned, the Superintendent General of the Fushun Collieries, or the Superintendent General of the Anshan Iron & Steel Works.

Section XIII. Nurse Training Institute.

Nurse training institutes are attached to the Railway Hospitals at Dairen, Fengtien (Mukden), Fushun, and Antung, to give necessary lessons for nurses.

The term of training runs for two years divided into two terms.

The first term is employed with class work, in addition to practical training; the second term is devoted to the application of the principles taught in class room to practice and also practical training.

Section XIV. Lecture Class for Midwives.

A lecture class is held at the Railway Hospital, Dairen, in order to turn out good midwives, both Japanese and Chinese, for service in Manchuria.

Chapter III. Epidemic Prevention.

I. General Epidemic Prevention.

The marine quarantine in the Kwantung Leased Territory is looked after by the Marine Bureau of the Kwantung Government, while the epidemic prevention

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work on land is undertaken by the Civil Administration authorities. Victims of the legally specified infectious diseases are, as a rule, accommodated at the quarantine station or the isolation hospital under Government management.

On this account, the South Manchuria Railway Company, keeping itself in touch with the Government authorities concerned, has been undertaking the disinfection of the Company's buildings, furniture, etc., that have become infected, the search for any carriers of germs of contagious diseases of the digestive organ, and vaccination, the extermination of flies in summer, and other precautions for epidemic prevention.

In October, 1915, simultaneously with the introduction of the Special Municipal System to Dairen, the South Manchuria Railway Company discontinued the epidemic prevention work, entrusting the same to the Dairen Municipal Office as far as Dairen is concerned, and that in the rest of the Leased Territory to the police authorities concerned, excepting the premises of the Shahokou Railway Workshops which continue to be looked after by the Workshops authorities.

All arrangements concerning epidemic prevention in the South Manchuria Railway Area are attended to principally by the Railway Company. The victims are accommodated for treatment at the hospitals and isolation houses maintained by the Railway Company, whilst all disinfection and other preventive procedures outside the the jurisdiction of the administrative police are attended to by the institutions provided for the purpose of looking after the sanitary affairs of the district concerned. The expenses needed for the treatment of the patients and also epidemic prevention are defrayed out of the public rates and the local administration list of the district concerned.

When in the latter part of October, 1910, the pneumonic plague broke out in North Manchuria and, spreading southward steadily, invaded the South Manchuria Railway Area in December of the same year, an extraordinary epidemic prevention department was opened by the Kwantung Government, the major portion of the necessary expenses being borne by the National Treasury. But, the Company's disbursements as regards the preventive arrangements were not at all inconsiderable. The Company's contribution to the National Treasury amounted to ¥393,000, whilst what was contributed to the Chinese Government, etc., reached ¥155,000,

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besides more than ¥310,000 laid out for the Company's own sake, raising the total outlay to more than ¥800,000.

Again, when cholera epidemic became prevalent all over Manchuria in 1919, the Kwantung Government was co-operated with, and no effort was spared to exterminate the [illegible] pestilence and minister to the needs of the infected, the Company defraying the best part of the expenses. The payments to the National Treasury were ¥360,000; the Company's own outlays, together with what was contributed towards the prevention fund for the districts under the Japanese Consular jurisdiction, amounting to ¥376,000. The total was ¥736,000.

Goods Cars converted into Detaining Station, Changchun.

In the latter part of August, 1920, bubonic plague broke out near Manchouli, followed with the appearance of sporadic cases of the epidemic in the neighbourhoods. By the latter part of December of the same year, the epidemic turned pneumonic plague, and in January, 1921, the scourge raged all over North Manchuria, forming a serious menace to the South Manchuria Railway Area.

The Kwantung Government then opened a branch office of the Extraordinary Epidemic Prevention Department at Changchun in an effort to check the southward advance of the epidemic.

The Railway Company, on its own part, loaned assistants to the Prevention Department and set about erecting and equipping a number of detention stations (for the detention of the low class Chinese travelling from the infected district), and isolation houses, undertaking the treatment of the victims and the disinfection work.

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Moreover, perfect concert was maintained with the Chinese authorities in the joint preventive campaign, thereby reaping very gratifying results.

Of the required expenses, the Kwantung Government defrayed roughly ¥530,000 and the Railway Company more than ¥130,000.

The pneumonic plague of 1920-1921 spread itself with alarming rapidity in North Manchuria, taking about 8,000 lives. It threatened to enter South Manchuria by railway and through foot travellers. And yet, the epidemic was successfully stopped at Changchun, save for one or two straggling cases of the dread epidemic having slipped into Kungchuling and Fengtien (Mukden). It was due to a harmonious co-operation between the Japanese and Chinese prevention authorities.

As regards the prevention work outside the S. M. Railway Area, it does not concern the Railway Company, but, for the benefit of the Japanese residing outside the Railway Area adjoining the Railway Towns at Wafangtien, Haicheng, Penchihu, Chiaotou, Lienshankuan, and Fushun, they were treated the same as the residents inside the Railway Area, and the prevention and relief measures for them were undertaken entirely by the Company.

Outbreaks of Infectious Diseases.

Speaking of the infectious diseases affecting the digestive organ, according to the statistics for the past ten years, typhoid fever produced the largest number of victims, followed by dysentery, paratyphus, and cholera. Scarlet fever, too, has claimed a very high figure of victims, small pox, eruptive fever, diphtheria, and the plague coming thereafter in the order mentioned. It may be added that eruptive fever has claimed more than about four-fifths of the total number of cases of the latter group; the plague cases were all Chineses and some four-fifths of the other seven kinds of infectious diseases were Japanese.

Below, a rough sketch of different kinds of infectious diseases in the S. M. Railway Area may be given:—

1) Typhoid Fever.

Typhoid fever appears either sporadically or as an epidemic according to places each year. Especially it broke out at Fushun in 1913, producing uncommonly many cases.

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The epidemic reappeared each subsequent year, but owing to preventive vaccination and other preventive measures that were carried out, the number of the patients have decreased since the fiscal year 1915, although subject to more or less variation. In the fiscal year 1916, however, many Chinese cases made their appearance at Kuchiatien (on the S. M. R. Main Line), creating an exception. It seems that prior to that, Mongolian troops had arrived outside the S. M. Railway Area for hostile operations, and had scattered about the disease germs.

(2) Paratyphus.

Paratyphus was included in the list of the legally specified infectious diseases in August, 1911, having been treated as typhoid fever before that. About the fiscal years 1914 and 1915, a comparatively large number of victims were reported, but since nothing worth mentioning has happened.

(3) Dysentery.

Like typhoid fever, dysentery appears sporadically or as an epidemic. Especially at Fushun, a comparatively large number of victims were produced annually from the fiscal year 1913. At Fengtien (Mukden) rather many patients have appeared in recent years.

(4) Scarlet fever.

Not a case of scarlet fever had appeared till 1908. In 1909, two cases occurred outside the Dairen Railway Area, in addition to three more in the Railway Area. Since it has broken out at different places, dying out for part of summer months only. In the rest of the year, it has seldom been stamped out, and especially in winter, the epidemic has been particularly malignant. Recently, it has appeared less often, so that it can hardly be called an epidemic.

(5) Small pox.

Small pox has appeared sporadically among the Japanese and the Chinese each year. Sometimes, the victims are in a considerable number.

(6) Diphtheria has so far been of a sporadic nature everywhere, and has never been prevalent.

(7) Typhus made its first appearance at Liaoyang in 1909, and sporadic cases have appeared at different places, but their number has been very small, except at Fushun where victims have been produced in a rather good number annually. It still appears there intermittently.

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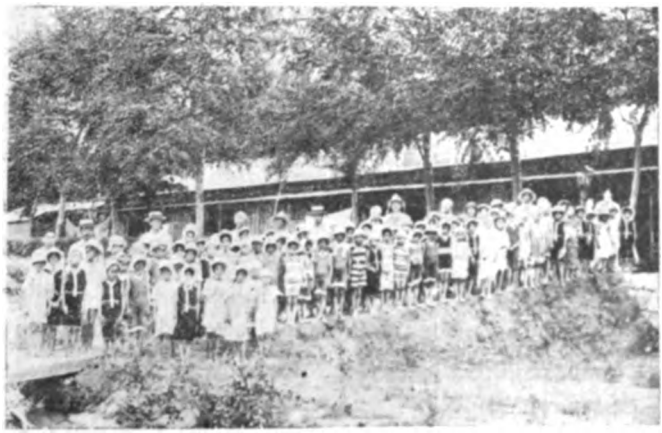
However, this disease infects Chinese coolies mostly and only few Japanese are attacked.

(8) Cerebrospinal Meningitis (of infectious nature).

This disease was included in the list of the infectious diseases to be controlled by the Regulations concerning Infectious Diseases in May, 1918. At that time, it was prevalent in Japan, especially at Osaka. In the South Manchuria Railway Area, three or four cases thereof have broken out sporadically at Fengtien (Mukden) only recently.

(9) Relapsing Fever.

Relapsing fever appears in a good number especially amongst the Chinese coolies in summer. It was made amenable to the Regulations concerning Infectious Diseases in June, 1913, and since any cases thereof have to be reported to the police. Thus, the statistics therefor prior to that time are not unascertainable, but from the figures available from July, 1913, till 1918, nine-tenths of the total number of cases were Chinese coolies, and the place of outbreak is principally Fushun, which is open to constant access of Shantung coolies who are thought to be importing the disease with them. Then, more cases have frequently appeared at several places along the South Manchuria Railway Lines, but their origin is said to have been traced in most cases to contact with the Chinese coolies at Fushun Collieries.



Hsiungyocheng Hot Spring Colony.
In front of Impromptu Rest Shed.

(10) Influenza.

The first cases of influenza broke out in various parts of Manchuria in May, 1918. It spread rapidly and produced about 21,000 patients, but most of them were light or mild cases, and took about a week to run its own course. It then

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subsided. In September of the same year, the epidemic reappeared and affected Japanese and Chinese of both sexes in a large number. It had no period of incubation. A high temperature lasted two or three days, affecting the respiratory, nervous, and digestive systems. In many cases, complications ensued in the shape of acute pneumonia or bronchial catarrh. Many of the cases ended fatally.

The Railway Company distributed about 2[illegible],000 printed copies of preventive hints among the Company's servants and other residents in the Railway Area.

All the Railway Hospitals, cooperating with the District Agencies and the police, carried out a preventive vaccination. Still the aggregate victims in all of Manchuria went up to 65,000, inclusive of over 1,000 deaths, the mortality rate being 1.5%.

In October, 1919, the "flu," which spread itself all over the world, reappeared in Japan and about Shanghai, invading Manchuria by November. It threatened to run amuck at Dairen, and so preventive hints and other circulars, all in print, were prepared and disseminated by tens of thousands of copies. At the same time, the Company's servants and their families received a preventive vaccination, so as to head off a possible repetition of the visitation of the preceding year, yet, the patients totalled about 3,000. This time, the epidemic wrought heavy havoc in the Kwantung Leased Territory, especially about Dairen. It could be stamped out only as late as February, 1920.

The epidemic visited South Manchuria twice a year in spring and autumn, producing tens of thousands of victims. The quest on how susceptible to the epidemic a victim, once attacked before, was in the second visitation of the same year was taken up for a study, with an eye to finding out, if possible, the key to immunity. The data were collected from the physicians, nurses, etc., concerned in the campaign against the epidemic. Of course, the scope of investigation was necessarily limited, but the subjects, from which these data were gathered, worked under similar conditions, and the statistical figures are considered as quite reliable.

The data are in substance as follow :—

a) Out of the total 478 persons, of whom enquiry was conducted, 193 persons or 40.2%, were infected, being classified into the initially infected and the re infected as under :—

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1) Out of 113 persons infected in the spring epidemic, the re-infected in the autumn epidemic numbered 40 (or 35.4%).

2) Of 365 persons, who were not infected in the spring epidemic, those infected for the first time in the autumn epidemic numbered 153 (or 4.19%).

b) Those who were not infected either in spring or autumn numbered 212 (or 44.3%).

c) The percentages of those who developed a complication or another were 19% for the initially infected, and 17.5% for the re-infected.

d) The average periods taken for treatment were 6.49 days for the initially infected and 4.31 days for the re-infected, the former taking 2.18 days longer than the latter. It may be said that the initially infected cases were more serious than the re-infected.

e) As stated in Clause A, the initially infected and re-infected were 41.9% and 35.4% respectively, leaving the difference of 6.5%. If the difference could be considered as a result of a measure of immunity secured by the previous infection, the figure would seem too trifling. Especially there was only less than six months intervening between the spring and autumn epidemics. Moreover, as there were a considerable number of the re-infected in the autumn epidemic, even if "flu" might be supposed to impart a degree of immunity to those once infected, (assuming that both spring and autumn epidemic in question were of the same kind) the period of immunity is probably less than six months.

f) Thus it may be concluded that, although "flu" leaves little sign of immunity on the lapse of six months, there is the difference of 2.18 days between the initially infected and the re-infected, as stated in Clause d, in the period wanted for treatment. What can give rise to this difference? This comparatively small number of cases, from which these deductions have been made, leaves doubt as to whether such a difference was merely accidental or it could have any bearing on the immunity derived from the initial infection.

This point awaits further enquiry.

II. Cholera Prevention.

Cholera made its appearance at Dairen, Ryojun (Port Arthur), Liaoyang, and Antung in summer, 1907, claiming heavier percentages of victims at Dairen and Port Arthur.

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The epidemic revisited Dairen and Port Arthur in August, 1909, producing a small number of victims at Yingkou, Tashihchiao, Liaoyang, Antung, etc. In 1910, only a few victims were produced at Dairen, Chinchou Yingkou, Tashihchiao, and Liaoyang. In 1911, the epidemic reappeared with greater malignancy at Dairen, Ryojun (Port Arthur), and Chinchou, but luckily, it did not spread beyond the boundaries of the Leased Territory.

Hsingyuching Hot Spring Colony
Deep breathing exercise on the sands

In 1912, only five cases were discovered, at the time of the quarantine examination among the crews and passengers of the ships visiting the port of Dairen. The epidemic kept off the Leased Territory and the S. M. Railway Area.

In 1919, however, in late spring, cholera which was prevalent Swatow way spread to Shanghai and then Tientsin. In July, it was imported into South Manchuria via Yingkou (Newchwang). It went above the Liao River and overran the whole of South Manchuria.

At the first news of the epidemic spreading in South China, the Railway Company feared its invasion into South Manchuria and maintained a close watch over the port of Yingkou (Newchwang), which kept up close communications with South China ports, and also kept an eye on the health condition of the inhabitants of the neighbouring Chinese villages.

This watch was rewarded. A few cases of cholera broke out at Yingkou; and cases of suspicious symptoms were reported from the Chinese Town of Yingkou outside the S. M. Railway Area.

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Then, the preventive plan was put in immediate execution. Detention stations, together with isolation houses, were hurriedly put up on a large scale at both Fengtien (Mukden) and Changchun. At all the centres where the Company kept District Agencies, improviso isolation houses were erected, and to each Railway Hospital was attached a consultation office specially for cholera cases. Moreover, disinfecting arrangements were provided on fifteen passenger trains, against a possible outbreak of cholera on board.

As the epidemic assumed a more serious aspect, the Company, in conjunction with the Kwantung Government, organized an Extraordinary Epidemic Prevention Office, with its headquarters at Fengtien (Mukden), so that, because of its central location, the preventive measures might be gone about more expeditiously, and the campaign might be better directed and controlled. In this campaign, over seventy prevention experts and about 100 police officers were engaged from Japan, in addition to dozens of prevention watchers recruited for temporary service. Special details were allotted to the isolation houses, observation stations, quarantine on board the vessels and trains, preventive vaccinations, house-to-house visitation, disinfection, disposal of the infected corpses, etc.

Attention was concentrated at Dairen and Fengtien (Mukden), whilst, at other places, the preventive staffs were readjusted to the local necessity. The Government authorities concerned, co-operating with the District Agencies, the Railway Hospitals, and the Traffic people, bent their joint energies on the extermination of the epidemic. The majority of the victims being Chinese coolies, the preventive campaign was handicapped with sundry difficulties, and the victims, inclusive of Japanese, Chinese, and foreigners, totalled more than 13,000, containing over 6,300 fatal cases. The epidemic was suppressed at last in October of the same year.

In April, 1920, cholera broke out in the district under the jurisdiction of Tainan Prefecture, Formosa, and spread itself all over the Prefecture. It invaded also South China and Japan proper, gaining in virulence by degrees. The Railway Company, while having a quarantine inspection in the Harbour of Dairen inaugurated, did not neglect to keep watch over the Peking-Mukden Line of the Chinese Government Railways. Further, co-operating with the Government-General of Chosen, the Korean frontiers on the Yalu were closely guarded against Japan and Shantung.

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Several cases broke out in Chosen, and, in June of the same year, a Japanese case appeared suddenly. Due precautionary measures were taken at once. Useful preventive hints were distributed by tens of thousands of copies; at the chief centres, cinema pictures representing how to set about a preventive campaign were shown, to rouse the attention of the general populace. Then, a preventive inoculation was also carried out. On July 23rd, the Yingkou-Tientsin regular liner "Ising" brought thereto a thousand and a few hundred Chinese coolies. It was found that the same ship carried on board a corpse and a cholera case, but the Customs authorities allowed this host of passengers to go ashore without detention. At this piece of news, a restriction was imposed on the entraining of Chinese coolies at Yingkou, and none of them had railway tickets issued, other than such as had received a preventive vaccination or were provided with certificates for the examination of the excrements.

At the same time, by negotiation with the Chinese authorities, the enforcement of a preventive vaccination and a quarantine detention were recommended. However, the Chinese passengers, who had arrived by the infected ship, had kept travelling north, and as it was difficult to take the S. M. R. train at Yingkou, they would cross the Liao and get to the Chinese Yingkou Station on the north bank, to travel by the Peking-Mukden Line via Koupangtzu and Fengtien (Mukden). The Railway Company sent officials to the important points of landward communications to examine the foot travellers. At the same time, physicians were sent to the Chinese Yingkou Station on the north side of the Liao to investigate the local conditions. It was discovered that cholera had broken out at villages at the east of Koupangtzu and was on the spread. The quarantine examination at Fengtien (Mukden) was made more rigorous, and on this account, no victims appeared in and about the S. M. Railway Area. Only, there was one solitary case near Liaoyang, and the malignant and slippery epidemic could be stamped out.

From the past experiences, cholera has in many cases got into South Manchuria at Yingkou (Newchwang) by sea, and the quarantine inspection at that port is conducted by the Customs physician. It is to be devoutly hoped from a humanitarian point of view that that port will maintain a close quarantine vigilance.

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III. The Plague.

In October, 1910, news was received that the plague had broken out in North Manchuria, but as no further details were available, the Railway Company despatched the Superintendent-General of the Dairen Railway Hospital to Harbin to report on the conditions prevailing thereat. It was learned that the scourge had already invaded the City of Harbin, and the situation was quite serious. Accordingly, preventive arrangements were taken in hand promptly. It happened that, as it was nearing the old Chinese New Year holidays, the coolie immigrants into North Manchuria were coming down south. Some of them manifested symptoms of infection on the way and strewed the disease germs on all hands. Since its first appearance at Manchouli on the Siberian frontier in the latter part of October, it spread rapidly to North Manchuria, Chihli and Shantung Provinces. Thereupon, the Railway Company hurried up with the erection of the impromptu isolation houses and detaining stations along the Railway Lines. As it was feared that the scourge might be transmitted by coolies travelling southward by train, the transportation of Chinese coolies by the south bound train was suspended temporarily on consultation with the Kwantung Government. However, Chinese coolies are great foot travellers and it will not do merely to discontinue the railway traffic. The Chinese authorities were then approached to stop the southward travel of these coolies altogether. On the Japanese side, watchers' stations were opened at several points to the end of cutting off the communications. Moreover, no Chinese vehicles were admitted into the Railway Area from outside the same. Residents of the Railway Area, when intending to travel, were required to take with them certificates issued

Hsiungyoheng Hot Spring Colony
Children left to their own fancy.

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by the authorities concerned. Prior to this, the Kwantung Government had founded the Extraordinary Epidemic Prevention Department in order to control the prevention campaign as a preventive administrative institution, alert and active. Further, in order to effect the communications between the Japanese and Chinese preventive organizations, an Epidemic Prevention Office was founded at Mukden with Gov.-Gen. Viscount Oshima at its head. His Excellency met the Viceroy of Manchuria at Mukden and conducted an exchange of views concerning the Sino-Japanese joint preventive crusade. This led to the opening of a Sino-Japanese Joint Epidemic Prevention Conference at which a good mutual understanding was formed and the necessary arrangements were agreed upon. The Railway Company further donated the sum of G.¥150,000 to the Viceregal Office of Manchuria to be defrayed for the prosecution of the preventive crusade.

As above stated, no effort was spared to combat the epidemic, but the inevitable could not be checked halfway. The victims reported from the Kwantung Leased Territory and the South Manchuria Railway Area totalled over 200, whilst the aggregate cases in all South Manchuria reached far over 40,000. The havoc wrought was really shocking. Luckily, a happy concert between the Japanese and Chinese prevention staffs, coupled with the voluntary co-operation of the Japanese residents, the dread pestilence was completely suppressed in the latter part of April. It was to be particularly congratulated that not a Japanese got infected throughout the epidemic.

In December, 1917, a report of the outbreak of the pneumonic plague in the Pachelolon district, Mongolia, was received. In about ten days' time, it entered Suiyuan and Kueihuacheng, and by February, 1918, it spread to the breadth and length of Shanhsi Province. Finally it invaded Chihli Province and advanced along the Peking Kalgan Railway and closed in upon Peking. Soon it broke out at Tsinan and started to spread thereabout, presenting alarming possibilities. The Railway Company despatched Dr. Tsurumi in that direction to inspect the ground and to co-operate with the Chinese.

In Manchuria, in view of the bitter lesson learned, a preventive plan was drafted and every preparation was made to put the plan into effect at a short notice. Fortunately, through the self-denying activities of the foreign physicians in China and also the efforts of the Chinese authorities, the epidemic could be

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confined to part of North China and Shantung, without tainting South Manchuria.

In August, 1920, the outbreak of the bubonic plague about Abakait near Machouli on the Siberian frontier was reported. Subsequently it appeared at various points and turned to the pneumonic plague by the end of December, contaminating Hailar and Dalai Nor. It proceeded eastward like a flood and ravaged, with Harbin for the centre.

The Railway Company, in conjunction with the Kwantung Government, organized a Quarantine Office, keeping a branch at Changchun with the object of intercepting the southward march of the pestilence. At Tashihchiao, Fengtien (Mukden), Kaiyuan, and Changchun, railway sidings were laid in a hurry and goods cars were kept on these sidings for the accommodation of emergency victims. At Changchun, the Junction Station with the Chinese Eastern Railway, detaining stations were put up at two points, capable of accommodating over 1,000 victims each, and the 3rd class passengers (chiefly Chinese coolies) who intended to change cars after travelling by the Chinese Eastern or the Kirin-Changchun Lines were detained at these Stations for five days, and none other than provided with certificates of good health either had the railway tickets issued to them or were permitted to continue their journey southward.

On board each south-bound train, a quarantine officer and a police officer were put, in order to examine the passengers.

In order to make the frontier prevention work effective, the sincere co-operation of the Sino-Japanese authorities was necessary. Therefore, consultations with the District Superintendent of Kirin-Changchun, the Japanese Consuls, concerned, etc., were held frequently so that a happy concert might be preserved.

The Chinese side raised a commodious detaining house at Kwanchengtzu, the southern terminus of the Chinese Eastern Railway, besides erecting like houses at a few principal stations on the Southern Section (Harbin-Kwanchengtzu) and Harbin. Thus, the railway passengers were detained and quarantined. At the same time, Japanese and Chinese specialists were made to board each train from Harbin to detect any cases of infection among the passengers. In addition, a Japanese medical expert was made adviser to the Chinese authorities, so as to act as a medium between the Japanese and Chinese sides in order to insure a concert in their joint campaign.

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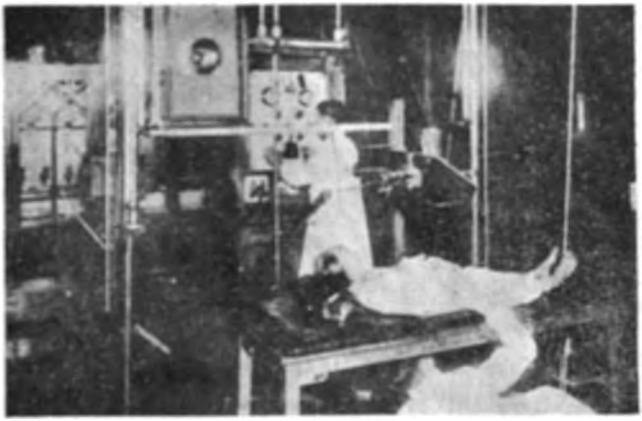
As the quarantine inspection on board the South Manchuria Railway trains at Kwanchengtzu and Changchun grew very strict, many south bound coolies took to travelling on foot. Moreover, a good number of them got off the Chinese Eastern Railway trains before reaching Kwanchengtzu or Changchun, in order to evade the quarantine inspection at both places. Therefore, watchers were kept on the chief roads of foot traffic and a request was made to the Chinese side to maintain a strict quarantine within the walls of Changchun.



Interior of Roentgen Room, Dairen Railway Hospital
New Buildings under construction for ¥3,500,000.

With all these precautions, the epidemic showed few indications of abatement and took altogether some 8,000 lives. This alarmed the inhabitants. Those detailed on the actual preventive campaign were kept very busy with taking care of the daily fresh cases appearing among the inmates of the detaining stations and isolation houses, numbering by hundreds. Their utmost efforts, combined with the harmonious co-operation between the Japanese and Chinese prevention authorities, enabled them to check effectually the spread of the dread scourge on the line of Changchun, allowing only one or two straggling cases to slip into South Manchuria. The epidemic nearly subsided in the latter part of June.

The Railway Company contributed the sum of G.¥20,000 towards the Chinese prevention expenses in the above epidemic.

IV. Vaccination.

Hitherto vaccination against small pox used to be held twice a year, in spring and autumn, and also whenever deemed necessary.

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In February, 1913, the Regulations concerning Vaccination were published, by which the periodical vaccinations have been reduced to only once a year, with the reservation that it may be held whenever deemed necessary. The necessary expenses are paid out of the public rate. As to the showings given by the vaccination, the mean for the five-years preceding 1911 was 64.2% for the Japanese and 71.3% for the Chinese, with regard to the effectiveness of vaccination, throughout the whole district under the jurisdiction of the Kwantung Government. The above showings referred to the vaccination of the first stage, that is, babies not more than a year old, and were far from satisfactory. However, the mean for the five years from 1912 turned out better, with the figures standing at 92% for the Japanese and 90.5% for the Chinese.

As to the vaccination for the residents in the South Manchuria Railway Area, it was conducted by the Company's District Agencies, in conjunction with the Police Offices concerned, for people of all nationalities.

V. Prevention of Hydrophobia.

There are not a few cases of bites by dogs afflicted with, or suspected of, rabies in all Manchuria. However, as those so bitten have been properly attended to, such as have been seized with hydrophobia have been comparatively few, the total being only twenty odd victims within and without the South Manchuria Railway Area since 1908. Of these cases, about three-quarters of the people bitten were attacked by dogs kept by their owners, the remainder being ascribed to homeless mongrels.

The control of the domestic dogs is undertaken in the Kwantung Leased Territory chiefly by the police, but in the S. M. Railway Area, the hygienic executive organizations of the Railway Company co-operated with the police. Then, twice a year, in spring and autumn, and whenever deemed necessary, a campaign against homeless dogs was carried out, and any one bitten by a dog suspected of rabies received a Pasteur treatment at the public expense.

VI. Prevention of Tuberculosis.

Those who die of tuberculosis in South Manchuria have been showing a gradually increasing tendency. From the statistics for the fiscal year 1917, the

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death percentage was 2.406%, being 0.427% more than 2.069% as the death rate in Japan proper.

It may be noticed that death occurred in large numbers among the young people, and this fact emphasized the necessity to lower the percentage.

The Railway Company, therefore, conferred with the Kwantung Government, and in October, 1920, the Manchuria Anti-Tuberculosis Society was formed to take up first of all the dissemination of information concerning the prevention of tuberculosis. It is proposed to open medical consultation offices for the detection of the afflicted as early as possible, and to follow in the future with adequate arrangements for the treatment of the cases of tuberculosis.

The Railway Company offers to undertake, when deemed necessary, the disinfection of infected premises in the Railway Area at public expense, if so applied.

Chapter IV. Protection of Public Health.

Section 1. Railway Hygiene.

The railway hygiene arrangements of the Railway Company are dissimilar from others. Since the Company has to look after the public hygiene in the Railway Area, these arrangements are included practically among the local administration works, and what may be specially termed as "railway hygiene" is quite limited, that is to say, it is confined to the hygiene about the passengers and part of the hygiene for the traffic officials and employees. In order to attend to this part of function, a qualified physician has been kept in the Sanitary Office of the Company since February, 1920.

At present, what arrangements there exist include the maintenance of the approved lodgings, first aid boxes, hot baths for the exclusive use of the locomotive crews, disinfection, and medical examination, and what concerns casualties resulting from the discharge of duties. All these fall under the attention of either the Traffic Department or the Personnel Office, and, in the sense of "railway hygiene," little beyond giving technical remarks is done. Nonetheless, how all these become developed are worth noting, as may be seen from the following :—

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(1) Approved Lodgings.

What is known as "approved hotels and lodgings" is similar to "Lodgings Class A" of the Imperial Government Railways, Japan. They are for the lodging and rest of the train crews, and improvements are now under way to the end of completing the best appointments for the refreshing and recuperating the effects of hard work.

As matters stand, old buildings erected by the Russians are pressed into service, or in a few cases, part of the bachelors' quarters is used, although both sleep and nutriments receive serious attention.

The lodgings recently converted at Dairen, Antung, and Chikuanshan have been designed materially on the principles proposed by Dr. Bremer, the Railway Sanitary Officer, Germany, and are conceded as the finest of their kinds in the Orient.

Interior of Bacteriological Room, Dairen Railway Hospital.

A rough sketch thereof is as follows:—

a) Each room contains 4½ mats (1 mat being 3×6 ft), provided with a bed. One room is assigned to each person. Ventilation and good light are provided. The room is heated by steam.

b) The night gown, dressing gown, quilts, pillow cases, and sheets are furnished free. With the exception of the dressing gown, the others are washed once every few days.

c) Hot bath is provided at all times.

d) A mess room is specially kept open, and meals are supplied at moderate rates. The meal hours are not fixed, due consideration being given to the hours of arrival and departure of the trains and also to the non-disturbance of sleep.

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e) A reading room has on file three or four kinds of newspapers and magazines, in addition to the Company's Official Gazette, which are open to perusal after rising in the morning.

f) The lodgings are looked over by a caretaker, who follow how the lodgers sleep and rest so as to maintain oversights in the discharge of their duties and to keep the lodgings in good order.

The places where the approved lodgings are kept, together with particulars, are as under:—

	No. of rooms	
Dairen	32	Each room has 4½ mats.
Wafangtien	7	" 6 mats
Tashihchiao	23	18 rooms with 5½ mats each, 3 rooms with 6 mats each, 2 rooms with 7½ mats each
Yingkou	2	8 mats each
Liaoyang	6	2 rooms with 9½ mats; 2 rooms with 6½ mats, 1 room with 6 mats, and 1 room with 6 mats.
Fengtien Mukden, ...	16	1 room with 8 mats; 8 rooms with 7½ mats each; 3 rooms with 6½ mats each; 1 room with 6 mats, 1 room with 5 mats; 1 room with 4½ mats.
Tiehling	22	6 mats each.
Changchun	21	17 rooms with 6 mats each; 4 rooms with 9 mats each
Fushun	2	8 mats each.
Chiaotou	3	10½ mats each.
Chikuanshan	14	4½ mats each
Antung	38	4½ mats each.

(2 First Aid Boxes.

The First Aid Boxes are kept at the fourteen principal stations, including train-despatching stations, such as Dairen, Wafangtien, Tashihchiao, Liaoyang, Fengtien (Mukden), Tiehling, Kungchuling, Changchun, Fushun, Chiaotou, Chikuanshan, Antung, Yingkou, and Ryojin (Port Arthur). Like Boxes are kept also on the passenger trains. The contents of these Boxes are used whenever occasion may require. It is intended to distribute in future to intermediate stations medical relief boxes, the contents of which are for emergency use when wanted by the Company's servants and their families.

(3) Hot Baths for Locomotive Crews.

A hot bath for the exclusive use of the drivers and stokers of the locomotives is maintained at each engine shed.

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(4) Disinfection.

Necessary materials for disinfection are kept at each Station and on board each passenger train whenever some epidemic is prevalent. But, in ordinary times, the matter concerning disinfection is left to the District Agencies, and all that is done is confined to the deodorization of the spittoons on the trains and also at the Stations, and also of the lavatories thereat.

(5) Medical Examination.

A medical examination is held over the Company's servants once a year periodically. The medical examiners are supplied by the nearest Railway Hospital maintained by the Railway Company, or else the public physicians belonging to the Company perform the task. The medical examination of all those engaged in the Railway Traffic has never yet been carried out under one superintending physician.

(6) Observation of Carbonic Acid Gas in the Train.

In winter, the windows and ventilators of the cars are kept closed most of the time.

Matters attended to by the Railway Sanitary Officer may be tabulated as under :—

a) Inspection and investigation of the approved Lodgings.

b) Inspection and investigation of the interior of the trains from a sanitary point of view.

c) Inspection and investigation of matters deemed necessary from a hygienic point of view concerning those employed at the Station Buffets and the railway passengers.

d) Investigation of casualties resulting from the performance of duties on the part of the Traffic officials and employees, and also of special diseases.

Section 2. Mining Hygiene.

The Mining Law is not in force either in the Kwantung Leased Territory or in the South Manchuria Railway Area. Then, most of the miners are Chinese, and only about 10% of them consists of Japanese. Especially, as to the mining men, they are all Chinese to the man. On this account, it is impossible to apply

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the Japanese Mining Law to them. At present, the Railway Company, for the above reason, is trying to look after the sanitary welfare of the miners and others concerned in the mining industry directly or indirectly on the Company's own volition, and this particular work is entrusted also to the Railway Sanitary Officer.

The collieries under the direct management of the Company are only those at Fushun and Yentai. As to the number of the mining coolies that form the main subject of the mining hygiene, the figures for from the fiscal year 1913 are as under :—

At the end of	Fushun Collieries	Yentai colliery
1913	5,833	200
1914	6,023	205
1915	5,303	210
1916	6,162	285
1917	6,758	350
1918	11,945	350
1919	11,340	440

As regards the movements of the mining coolies, speaking of the fiscal year 1918, those that entered the service of these collieries numbered 42,087, of whom 15,024 had been recruited by the Company, and 39,900 left the service. In the fiscal year 1919, those that entered and left the service were 49,417 (of whom 16,310 had been recruited) and 50,013 respectively. The excessive high rates of those that join and leave the Collieries service are quite beyond imagination. On this account, how to enforce the necessary sanitary arrangements and their investigation are all the more difficult.

Interclinique Ward, Dairen Railway Hospital.

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The casualty and sick lists in the fiscal year 1920 comprised 2,556 injured while on duty, 17,892 injured while off duty together with the sick cases. When each casualty case is calculated as so many as the number of the days, during which they were absent from their duties, the total reaches 149,304.

The sick cases, when classified, consist of 67.1% of external injury, 14.2% of skin diseases and kindred affections, 3.9% of disorders of the digestive organ, 3.5% of eye troubles and affections of the auxiliary organs, and 3.1% of affections of the respiratory organ.

The chief features of the direct hygienic arrangements made to combat the above mentioned ailments are as under:—

Medical Relief Stations.

Medical relief stations are kept at Open Cut No. 1, Chienchinchai Pit, Oyama Shaft, Togo Shaft, Yangpaipu Pit, Laohutai Pit, Wantawu Pit, Hsintun Pit, and Lungfeng Pit, all of the Fushun Collieries, and at Yentai Colliery.

Such serious cases as are considered as necessary to be looked after in hospital are accommodated in the special wards for the exclusive use of the Chinese in the Fushun Colliery Hospital.

b) Arrangements for housing the Chinese miners, together with the mess-rooms and hot baths.

c) Disinfecting arrangements for the Chinese miners at the time of their arrival at the Collieries.

d) Emergency relief arrangements for inside the Pits and Shafts.

e) Other matters and also hygienic inspection are attended to by the sanitary experts assigned to the Fushun Collieries.

Section 2. School Hygiene.

As to the hygienic affairs of the different kinds of the Schools under the Company's management, each school has had its own school physician, the Primary Schools since the establishment of the Regulations concerning the Primary Schools in the S. M. Railway Area in February, 1908; the Chinese Primary Schools and others for Chinese children since the establishment of the Chinese Primary Schools in the S. M. Railway Area in June, 1909; and for all other schools, physicians

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in the service of the Railway Hospitals and public physicians have been appointed the School Physicians. For their service regulations, those laid down by the Ministry of Education are observed in substance.

The substance of the arrangements concerning the School Hygiene and matters of investigation is mentioned below :—

(1) School Physicians.

The school physicians engaged by the Railway Company totalled 35, as they stood in April, 1921. Of this number, 29 serve as the school physicians of the Primary Schools.

As to the Primary Schools under the Company's management, there were twenty-two containing the Higher Elementary Schools, two others, merely Primary Schools, and two, only branch schools.

The total school roll numbered 9,332 (by the returns obtained at the end of April, 1921); the average number of the school children assigned to a school physician was 332.

Again, the School Physicians hold concurrently the posts of the physicians for the nurseries and the Chinese Primary Schools.

As to the schools above the intermediate grade, not less than one school physician are appointed to each.

2) Physical Development of Japanese and Chinese School Children.

Studying the physical development of the Japanese school children from the results of the physical examination of the school children, more or less variation has been observed according to schools, but when the average data obtained from them are compared with those for the children in like schools in Japan, it has been found that the boy-children, in the younger grades, are superior in stature to their brother children in Japan, but the case is reversed in the case of the children in the higher grades. As regards the girl children, those in South Manchuria are shorter than the others in Japan at the age of twelve, but at the other ages, they do better.

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With regard to the weight of the body, both boy-and girl-children, especially the latter, are superior to the school children in Japan. As to the bust, the Manchurian children of both sexes are a little inferior to the children in Japan.

Next, as to the Chinese school children, when the average results of the medical examinations conducted at the Chinese primary schools during the three years of 1919, 1920, and 1921 are compared with the figures for the Japanese children in Manchuria, with reference to the stature of the boy children, there has been noticed more or less superiority and inferiority between the children of different ages in Manchuria and Japan, but, when compared as a whole, the children in Japan are a little superior to those in Manchuria. As to the girl-children, a little superiority has been noticed in the Manchurian children at the ages of 7 and 8, but at all other ages, an inferiority has been observed. Next, as regards the weight of the body, the Manchurian children are superior at the ages of 7 and 8, but at the other ages, a remarkable inferiority has been observed. A like thing may be said of the bust.

From the above it will be seen that the Chinese school children have, in many cases, slender, but tall bodies.

(3) Prevention and Extermination of Trachoma.

Trachoma spread most extensively among the various kinds of school diseases, so, much attention has been paid from the early stages as regards its prevention and extermination. In October, 1910, the services of Dr. S. Kitamura (Superintendent, the Ophthalmological Division) were secured for investigating how trachoma spread among the Japanese and Chinese children in Manchuria. In November of the same year, hints in print for the treatment and prevention of the epidemic were distributed.

From July, 1908, the Railway Company has undertaken to bear all the expenses concerning the treatment of the disease, so as to give all victims a free opportunity for cure.

In November, 1914, for such Railway Hospitals as have no ophthalmologists, the specialists in service in the nearest Railway Hospitals are ordered to visit such hospitals whenever deemed necessary.

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In May, 1917, Dr. Ogata (Professor of the South Manchuria Medical College) and Dr. S. Mori (Superintendent of the Ophthalmological Division, the Dairen Railway Hospital) were asked to inspect the conditions prevailing in all the schools.

In October, 1918, a guide to the prevention of trachoma in the schools was laid down, as a further preventive. From July, 1918, an ophthalmologist has been put on the staff of the S. M. R. Co. Sanitary Office to undertake the circuit treatment and the direction of the preventive campaign. At the same time, the school children are closely examined as to their eyes four times a year, in order to follow the prevalence of trachoma. As a result of the steady preventive and exterminating measures adopted, the epidemic has been subsiding year after year.

(4 Sick Percentage.

To know the kinds of diseases affecting the school children in Manchuria, which has an excessive climate, the two extremes of heat and cold, and also to find out with what frequency the epidemic diseases appear being of high importance for the preservation of good health of the children, the investigation of the same subject was commenced in August, 1918.

Now, we shall proceed to observe the sick monthly percentages of different kinds of diseases in the different schools in a recent year. The rates are the highest in December and the lowest in the two months of July and August.

(5) Ear, Nose, and Throat Diseases.

The ear, nose, and throat diseases have an important relation to the educational hygienic. In order to prevent the spread of the diseases and to treat their cases, Dr. Wada (Superintendent of the Rhino Laryngo Otology of the Dairen Railway Hospital) was asked in April, 1918, to look into the condition of infection among the Japanese and Chinese school children, and the more conspicuous features have been tabulated.

(6) Decayed Teeth.

Decayed teeth produce a serious effect on the development of the body and also on the progress of schooling. For the prevention of the disease, Dr. Tanaka

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(Superintendent, the Dentistry Division, the Dairen Railway Hospital) was requested in July, 1916, to look into the actual conditions of the Japanese and Chinese children. The results of investigations showed that the cases that were come across numbered somewhat more than the results obtained from the annual medical examination, although both tables agree with each other principally. The cases among the Manchurian children, compared with the children in Japan, number 50% more, and four times as many as the cases among the Chinese children.

(7) Arrangements for Physical Culture.

a) Swimming and Bathing.

In order to facilitate the healthy growth of the school children in summer, the Railway Company has been holding on the shores about Dairen united swimming and bathing each summer since 1910, making pupils above the 5th year grades of the Primary Schools along the S. M. Railway Lines take part in the same.

An enquiry into the effect of swimming and bathing upon the physical growth of the children has shown the results to be excellent. To be more concrete, the physical growth noticed in the course of eight months after participation in the swimming, the boys gave increases by 1.3% in weight, 1.1% in stature, and 1.1% in bust, compared with those who did not take part in the swimming, etc. The rate of increase has been found higher as the children rise in age. It has also been noted that the beneficial effect has been more remarkable with the boy children than with the girl children.

b) Summer Hot Spring Colony.

For the benefit of such feeble children, as have been barred out of the annual summer bathing, a summer hot spring colony has been organized at Hsiungyocheng Hot Springs since 1918, with a view to improving their constitutions. Children afflicted with innutrition, defective development, anaemia, scrofula, etc., have been accommodated in the Hot Spring Colony. The more remarkable signs are betterment of appetite and increase in weight, the increase rate being from 50% to 100%.

Again, as to the effect made on the constitution, in the case of the children, participating in the Colony, the sick rates for all kinds of diseases have been found to be reduced. Again, with regard to both class work and outdoor exercises, the

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degree of fatigue is found much lower. Moreover, in the mental sphere, too, those hitherto prone to melancholy and indecision have been converted into more active boys and girls. Few of all these results can be aspired after, to be secured by any other means.

(8) Conference Concerning School Hygiene.

In June, 1917, the school physicians were called to the first conference, at which the condition of the prevention and treatment of trachoma cases, what measures to be adopted in future, and fifteen other questions were discussed.

A second conference of a like nature was convened in February, 1919. At this conference were discussed such questions as an enquiry into feeble children as a preliminary to the holding of what may be called "glade schools" (classes being held in a grove), involving the investigation of the Binet system; the preparation of the children's development chart and enquiry into the cause of any malnutrition, if any such case be found; and fifty five others.

At the first conference of the Primary School Principals, as held in May, 1917, eighteen questions were presented regarding the school hygiene. At the second conference, in March, 1919, a dozen questions including "physical exercises for children" were submitted. In March, 1921, the third conference followed, and eleven questions, inclusive of one concerning feeble minded children were discussed.

Section 6. Waterworks and Sewage.

The examination of drinking water in the Kwantung Leased Territory and in the South Manchuria Railway Area is conducted by the Civil Administration authorities concerned. So, the Railway Company does not hold any such examination unless when deemed specially necessary. As to the water of the waterworks in the Railway Area outside the Leased Territory, it is regularly examined by an expert sent out for the purpose once a month. As regards the well-water, a pharmaceutist belonging to the Railway Hospitals is asked by the Company's District Agency and the Secretary's Office of the Fushun Collieries, and also of the Anzan Iron & Steel Works to examine it twice a year (at present, after the rainy season and in the thawing season). As to any well water pronounced as unfit to drink, steps will be taken to improve the quality. Any well, the water of which is hopeless of sufficient improvement, may be closed to use altogether.

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As regards the sewage installations in the Railway Area outside the Kwantung Leased Territory, like the waterworks installations, they belong to the control of another unit of the Company. As to the drainage, the Sanitary Office, too, has a say in the matter, and for the removal of the contents of the cesspools, no inconsiderable amount of money is defrayed from the public rate and sanitary list each year.

Section 5. Cleaning Operation.

The cleaning operations in the South Manchuria Railway Area are carried out by the District Agency, or the Secretary's Office of the Fushun Collieries or the Anzan Iron & Steel Works. The police act in concert in the matter. The cleaning operations are held twice a year in spring and in autumn. Besides, the removal of the night soil, etc., and refuse matter including ashes, is undertaken.

There are a few cases, in which the Railway Company has such works as above mentioned or part thereof under the Company's direct management, but the rest are all entrusted to the contractors. Even, in the case of the contractors doing the works, a few overseers are detailed to direct the operations.

In Manchuria, the winter lasts longer, and as the cold is so intense that the ground gets frozen to the depth of some feet from the surface, the difficulty attending the removal of the night soil and foul water is worse than imagined. Besides, the ashes and clinkers produced by the heating appliances in winter lasting nearly half a year amount to a considerable quantity, and their disposal is no easy task.

In summer, the mixed residence with the Chinese, whose idea of hygiene is only rudimentary, brings about unsanitation. Refuse matters are strewn about, attracting swarms of flies, which make ready mediums for spreading infectious diseases. Effort has been used for the extermination of flies.

The removal of filth and refuse matter is executed mainly with carts. However, at such large towns as Fengtien (Mukden), Changchun, etc., the methods followed hitherto have proved inadequate, and light rail lines have been laid for the purpose of transportation.

As to the disposal of nightsoil, etc., the Chinese, unlike the Japanese, do not use the night soil for manure. They make a pool for the night soil, and mixes mud and earth with it. Then, the mixture is dried, ready for the farmers' use. Such a primitive method cannot cope with the situation, and some way of disposing

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of the same by the latest chemical devices is being planned, and its early realization is striven for. In a few years' time, some ideal arrangement is expected to be introduced.

The sanitary and cleaning expenses defrayed by the Company annually for carrying out the cleaning operations in the Railway Area are as per attached table.

Section 6. Medical Examination of Company's Servants.

Matters concerning the medical examination of the Company's servants have belonged to the jurisdiction of the Personnel Office by virtue of the Regulations concerning the Functions of the Units. The Superintendent of each unit is required to hold a medical examination over the persons under him once annually and to report the results to the President. The superintendents concerned may choose an appropriate time to ask a physician of the nearest Railway Hospital to pass an examination. Special attention is paid to the good health of those concerned directly in the Traffic and they are subjected to a closer examination. The results are classified into "A," "B," and "C." Such as fall under the head of "D," something suitable is to be done.

By the existing system, the time for the medical examination is different and the units choose their own time. On this account, there can be no unification of diagnosis.

Therefore, in future it is to be hoped that all matters concerning the preservation of the good health of the Company's servants will be transferred to the control of the Sanitary Office.

As stated above, the matter lies outside the pale of the Sanitary Office, and so no detailed results can be had, but what information has been scraped up is as follows:—

	Officials & clerks	Employees	Total
"A"	68.3%	73.5%	70.9%
"B"	31.1%	26.3%	28.7%
"C"	6%	2%	4%

Classified according to the age, those, 20-25 years of age, contained the largest share of such as belonged to "C," the percentage being 2.4%. Among those from 25 to 40 years old, the quota for each age was materially the same, and 0.6-0.8% of those examined belonged to "C." There was none falling under "C" among those above 40 years of age and below 20 years old.

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Chapter V. Medical Treatment.

Railway Hospitals.

Railway Hospitals and Their Spheres of Service.

Hospital	Location	
Dairen	Dairen	Dairen-Sanshihlipu (inclusive) and also Ryojun Branch Line
Shahokou branch	Shahokou	
Wafangtien	Wafangtien	Sanshihlipu-Kaiping (not including Sanshihlipu and Kaiping)
Yingkou	Yingkou	Kaiping-Tangkangtzu (Tangkangtzu not included)
West Yingkou branch	West Yingkou	
Tashihchiao branch	Tashihchiao	Tashihchiao-Yingkou
Anshan	Anshan	Tangkangtzu-Shoushan (not included)
Liaoyang	Liaoyang	Shoushan-Shaho
Mukden	Mukden	Shaho-Hsintaitzu (both excluded) Suchiatun-Shihchiaotzu Suchiatun-Fusan
Branch within walls	Inside West Gate	
Tiehling	Tiehling	Hsintaitzu-Chungku
Kaiyuan	Kaiyuan	Chungku-Manching
Ssupingkai	Ssupingkai	Manching-Kuochiatien (both excluded)
Kungchuling	Kungchuling	Kuochiatien-Liufangtzu
Changchun	Changchun	Liufangtzu-Changchun (Liufangtzu not included)
Branch within walls	West Santaokou	
Penchihu	Penchihu	Shihchiaotzu-Tsaolokou (both excluded)
Antung	Antung	Tsaolokou-Antung
Fushun	Chienchinchai	Fuan-Fushun (Fuan not included)
Kirin Oriental	Kirin	

Railway Hospitals and Divisions.

Dairen	Including all the Divisions
Shahokou	Interclinique, Surgery, and Dentistry
Wafangtien	Interclinique, Surgery, Gynecology and Obstetrics
Yingkou	Interclinique, Surgery, Ophthalmology, Gynecology and Obstetrics, and Dentistry
Tashihchiao	Surgery and Interclinique
Anshan	Interclinique, Surgery, Kinderclinique, Gynecology and Obstetrics, and Dentistry
Liaoyang	Interclinique, Surgery, Kinderclinique, Gynecology and Obstetrics, and Dentistry
Fengtien (Mukden)	Including all the Divisions
Tiehling	Interclinique, Surgery, Ophthalmology, Gynecology and Obstetrics, and Dentistry
Kaiyuan	Interclinique, Surgery, and Gynecology, and Obstetrics
Ssupingkai	Interclinique and Surgery
Kungchuling	" " "
Changchun	Interclinique, Surgery, Kinderclinique, Ophthalmology, Gynecology and Obstetrics, Rhino-Laryngo-Otology, and Dentistry.
Kirin Oriental	Interclinique and Surgery
Penchihu	Interclinique and Surgery
Antung	Interclinique, Surgery, Kinderclinique, Ophthalmology, Gynecology and Obstetrics, Rhino-Laryngo-Otology, and Dentistry.
Fushun	Interclinique, Surgery, Kinderclinique, Ophthalmology, Gynecology and Obstetrics, Rhino-Laryngo-Otology, and Dentistry.

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	Surgeons-in-charge & Physicians	Head pharmacists & assistants	Chief clerk & assistants	Artisans	Nurses & Apprentice nurses nurses	& nurses
Dairen	39	10	18	12	82	17
City Branch ...	14	4	7	3	41	4
Shahokou branch	3	1	2	1	10	—
Wafangtien	3	1	2	1	8	—
Yingkou	7	1	2	2	11	—
West Yingkou ...	1	—	—	1	1	—
Tashihchiao ...	2	1	1	—	5	—
Anshan	8	2	6	6	20	—
Liaoyang	6	1	3	1	14	—
Mukden	15	6	10	5	91	19
Within walls	2	—	1	—	2	—
Tiehling	6	1	3	1	12	—
Kaiyuan	3	1	2	1	6	—
Szupingkai	3	1	2	1	7	—
Kungchuling ...	3	1	2	1	10	—
Changchun	8	1	4	5	29	—
Within walls	1	—	—	1	1	—
Kirin Oriental ...	2	—	1	1	4	—
Penchihu	2	1	2	2	9	—
Antung	10	2	4	3	28	15
Fushun	19	5	10	9	46	16
Total	157	40	82	57	437	71

	Japanese employees	Chinese employees	Total
Dairen	75	50	303
City Branch ...	36	15	124
Shahokou branch	4	3	24
Wafangtien	3	3	21
Yingkou	6	11	40
West Yingkou ...	—	2	5
Tashihchiao ...	2	3	11
Anshan	11	23	76
Liaoyang	5	9	39
Mukden	45	40	237
Within walls	—	5	10
Tiehling	4	11	38
Kaiyuan	4	7	24
Szupingkai	2	6	22
Kungchuling	4	10	31
Changchun	7	17	71
Within walls	—	2	5
Kirin Oriental ...	2	5	15
Penchihu	4	6	26
Antung	11	15	88
Fushun	31	68	201
Total	250	317	1417

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MANCHURIA ENLIGHTENING SOCIETY.

Whose Organ the "Light of Manchuria" is

What actuates us in our endeavours to open up Manchuria and Mongolia lies in realizing our ultimate ideal in the enlightenment and development of Manchuria and Mongolia. It will not do only to develop the natural and industrial resources, but the ethical and intellectual culture of the inhabitants must also be carefully husbanded and nourished, so that both mind and matter may be developed in harmony.

The Manchuria Enlightening Society raised its first cry in order to fill a sorely felt need. Its primary mission is to investigate and propagate the truths of the development of Manchuria and Mongolia. We shall studiously refrain from misleading the public by disseminating inaccurate or exaggerated reports, but shall steadfastly adhere to the truth or facts only.

It is urgently important that the truths regarding Manchuria and Mongolia should be made known clearly not only to Japan and China, but also to Europe and America. On this account, the establishment of the Manchuria Enlightening Society is bound to have a serious significance of international character.

If happily, through the establishment and activity of this Society, the truths of the development of Manchuria and Mongolia should become topics of world wide interest, it would not be only an honour to those now actively engaged in developing these regions, but also a matter of congratulation to the world at angle.

We might be permitted to add that the ultimate ideal and desire of this Society are to serve as the herald of all enlightening movements in future, thereby opening a new chapter in the annals of the world's civilization.

What is the Society Like.

a) Office.—The office of the Society is in the Municipal Office Building on Central Circle in the city of Dairen.

(b Society's Work.—The works of the Society include the following :—

1. Publication of the organ of the Society, The "Light of Manchuria."

2. Supply of general information through the Society and by other means, giving the results of such investigations and researches as may be conducted in the interest of the development of natural, industrial, and other resources in Manchuria, Mongolia, and Eastern Siberia.

3. To act as guide to intending investors in general in all kinds of enterprises in Manchuria, etc., and also to undertake any special investigation or research on application by promoters of all kinds.

4. To offer facility to travellers on inspecting visits to Manchuria, Mongolia, Siberia, Chosen (Korea), China, etc., to the end of imparting accurate information and rendering their observations as close to truth as possible.

5. To use all kinds of means in order to propagate the true conditions obtaining in Manchuria, etc., and further to carry on the propaganda work for these regions through the medium of lecture meetings, exhibitions, etc.

6. To compile, publish, sell and distribute books, pamphlets, etc., bearing on Manchuria and Eastern Siberia.

7. To carry on other works necessary for disseminating information on Manchuria, etc., and also for fostering economic enterprises therein.

c) In carrying on the above work, the Society is divided into the following :—

Secretariate,
Research Department,
Publication Department,
Intelligence Department, and
Accounting Department.

d) Any one wishing to join the Society is requested to send in a written application, giving the name and address, accompanied with the

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membership fee for not less than three months paid in advance.

c, The membership fee, entitling the member to a copy of the monthly organ, costs 90 sen (1 yen) per month and ¥6 per annum.

Remittances.

All remittances to the Society may be made most conveniently and safely to Transfer Savings No. 2850, Dairen. No receipts for the same will be issued, but instead the Society's monthly organ will be sent.

Officials.

Baron S. Goto (Mayor of Tokyo), President.

Mr. S. Hayakawa (President, South Manchuria Railway Company), Chairman;

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BEAN CAKE EXPORTERS AND BEAN MILLS AT DAIREN.

By Mr. K. Seki.

What an important place is occupied by Bean Cake in the export market of Dairen or, in a more extended sense, of Manchuria needs no reiteration. And so much as about 96% of the export Bean Cake is shipped to Japan proper and Formosa for use as manure by the farming classes.

Therefore, Bean Cake plays a prominent role to both trade and industry of Japan. There are sundry points for further improvement in order to develop the business and to contribute to the national weal. But, we should like to point out first of all to the Japanese exporters of Bean Cake the desirability of operating bean mills additionally to their export-business.

The advances of the Japanese importers at home to the Bean Cake exporters at Dairen as regards intended bargains are mostly made when the price happens to be rather low at the producing centres. To such advances the Dairen exporters are responsive when the market promises further fall or they take to closing future or long-termed deals, to meet the particular demand, on the Exchange at a pittance of profit margin.

If any miscalculation be made or an unlucky fluctuation take place as to the freight money or some other items, the exporters will entail more or less loss because of the only narrow margin between the buying and selling prices. Indeed, the returns for bearing the whole of the risk till arrival at the port of destination (import) were indeed trifling. Therefore, the exporters at Dairen feel always constrained to do business that partakes of more or less speculation, which point is to be heartily regretted as a great flaw.

Looking ahead over the prospect of the Bean Cake market of Japan, out of the total amount of manure consumed therein annually, valued at between ¥150,000,000 and ¥160,000,000, about ¥100,000,000 is being invested in Bean Cake, which fact shows it to be the cheapest and at once efficacious, but the outlook for the price cannot be said to be all rosy.

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Why the demand for Bean Cake in Japan has increased seems to be partly because the comparative advantage of Bean Cake as fertilizer has come to be more widely appreciated among the farmers, and partly because, during the war time, the difficulty to import chemical fertilizers and their stiff prices have set off to advantage Bean Cake in spite of its dearness owing to the rise of silver.

On this account, if chemical fertilizers should fall in price in the future, Bean Cake will have a slender chance to get its demand and price raised, unless it goes down still lower in price.

And yet, silver still fluctuates between 33d. and 34d. If there should be a likelihood for more or less ascent, the price of Bean Cake might be expected to go up more or less in case of its demand being further exploited. Still, from the general situation, the future of silver is not at all reassuring. With the descent of the general prices and the gradual increase of the Bean outputs, Silver might be said to have a declining tendency.

Therefore, the exporters might, as a general trend of event, look for a fall in the Bean Cake price.

Under these circumstances, the position of the Bean Cake exporters has become more awkward.

As already stated, the importers in Japan usually approach the exporters at Dairen when the price here is held the lowest. Thus, it very often becomes impossible to refrain from looking for the "future" goods out of an anticipation that the price has not yet touched the bottom. So some reactionary stiffening of price may follow only naturally. From all these factors it will be found very doubtful, in more cases, to expect the price cheaper than at the time when the bargain has been closed.

Now, the majority of bean mills at Dairen lie under Chinese management. Such as are managed by Japanese, together with others run under Sino-Japanese joint management, which may be included in the sphere of Japanese influence, number only seven or eight, with the total producing capacity of only about 30,000 pieces of Bean Cake a day. Those worked by Chinese are put at sixty-one, their aggregate outputs reaching some 110,000 pieces. The difference defies comparison. So, it may be stated that the supply of Bean Cake is controlled to a certain extent by the policies to be pursued by the Chinese mills.

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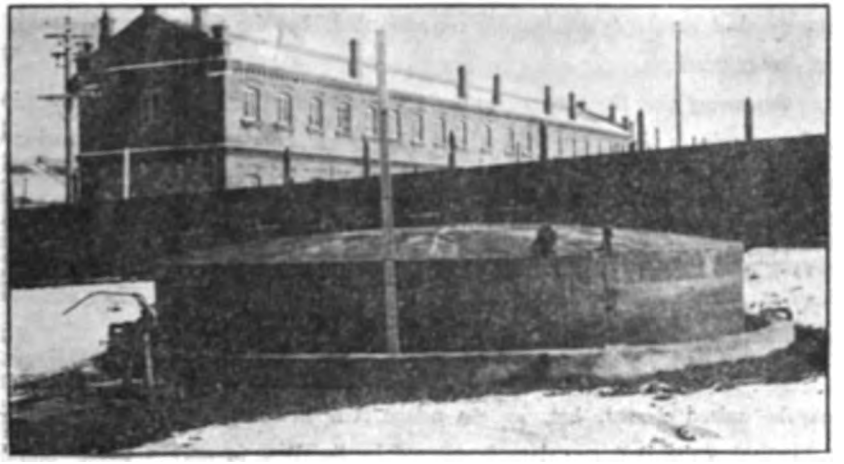
The Manchuria Beans that are shipped out of Dairen ranges from some 1,500,000 tons to 1,8[illegible] tons. Excepting some 5[illegible] tons, that are exported in the form of Beans, a quantity of Beans between 1,[illegible] tons and 1,3[illegible] tons represents what is consumed by the bean mills at Dairen and in the interior of Manchuria, yielding Bean Cake to an amount from 3[illegible] pieces to 4[illegible] pieces.

Accordingly, the price of Bean Cake ought to be controlled in principle by the relation between supply and demand and the fluctuation of the relative



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quotations between gold and silver. However, in the present condition, in which the Japanese are always buyers and the Chinese mills sellers, the exporters, who act as the medium for filling the need in Japan, should be said to stand in a risky position, once a shock overtakes the financial or economic circle.

Supposing that, after concluding deals with clients in Japan, the exporters have bought "futures" on the Dairen Exchange, there exists no institution guaranteeing the faithful execution of the terms of the contract. Even in the event of the clients concerned having issued a letter of credit, the same may be cancelled at any time at the buyers' discretion. Therefore, if there should be a sharp fall on the market, there is always danger of facing a breach of the contract on the buyers' part. In such case, the purchase of the "future" goods made to

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avoid any undue risk regarding a possible change in price will end in inability to take delivery of the goods bargained for, and, if the re-sale of the same goods be attempted, it might further aggravate the market tone, and the exporters concerned will be bound to suffer heavily.

The risk would be still greater, if the exporters have bought in anticipation of higher prices, because of the absence of any adequate guaranteeing institution, as remarked above.

Let us now suppose the market to change for the better.

If, on the export contract having been closed, "future" goods be looked for, the deal itself may be happily consummated, but the profit thereon would be but insignificant.

Supposing that the contract with the clients in Japan should be cancelled, and a margin of profit be realized on the re-sale, it would be a defamation of the Dairen exporters in general in the eyes of the clients in Japan, and any such madness would be out of the question.

One or two of the importers in Japan might be guilty of a breach of the contract, but there are so large a number of them in the country. They will suffer but little from the appearance of a couple of "black sheep."

Next, in booking for "futures" in anticipation of a rise, the margin of ascent may be indeed cleared, but, as the adage runs in the Japanese business circle., "What takes the Bull 100 days is covered by the Bear in only 3 days," and the margin of profit is apt to be smaller, in most cases, than that of loss from a sharp fall of the market.

Such theorizing seems all the more tenable, because of there being almost no hope of the financial market of Japan being sufficiently improved.

An uncommonly liberal profit can be realized in such a line as indicated in the abnormal financial world during and immediately after the late War only, for instance.

We will now look at the question from a viewpoint of the Chinese bean mills.

The Bean Cake manufactured is for most part placed in the hands of the exporters by Spot Deals on the Produce Exchange. The actual amount delivered as the "future" contracts mature is limited to 10 to 20% of the aggregate business put through.

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Now their total annual outputs reach between 30,000,000 pieces and 40,000,000 pieces, and it is plain from the sum total of business done on the Exchange that all of these outputs are bargained off by future contract at one time or another, thereby showing that, on the part of the bean mill owners, there are two kinds of deals, viz., sale of Spot goods and sale on paper (which means that there is no actual stock to be handed over to the buyer at the time of bargain).

What should be the standard of the "future" price to be named in a deal to provide for a possible rise of that action?

It is very often to hear the bean mill owners complain of the low market quotations on Bean Cake and Oil by the side of the price of Beans, the material. But, such is only one of the backneyed passages that really mean nothing at all.

The Chinese mills at Dairen are alive that the impossible relation between the prices of Beans and the products has become all the more accentuated since the adoption of the Gold Standard instead of the Silver standard on the Dairen Exchange in autumn, 1921.

If such grumblings were well grounded, how is it that the mills have been working at so high a pressure as to have a considerable surplus, whilst they might be forced to reduce their productions, if not altogether swept off their feet.

This may be due in a good measure to these mills being amply funded and their being able to cut down the producing cost to the minimum, so holding a capability to endure long.

Still there is no gainsaying that such things as are conjured up by those shrewd Chinese to the mental vision do not exist.

It is true that a few Chinese mills have been brought to grief, but they have to thank themselves for it to their fatal proclivities to speculate on either the Sharestock or Currency Exchange.

This will prove beyond dispute that the bean mills under Chinese management are, on the whole, sound enterprises.

Therefore, the backings of "future" goods, at the lowest quotations, allowing, of course, for reasonable exceptions, may be considered to lie within a commercially workable limit.

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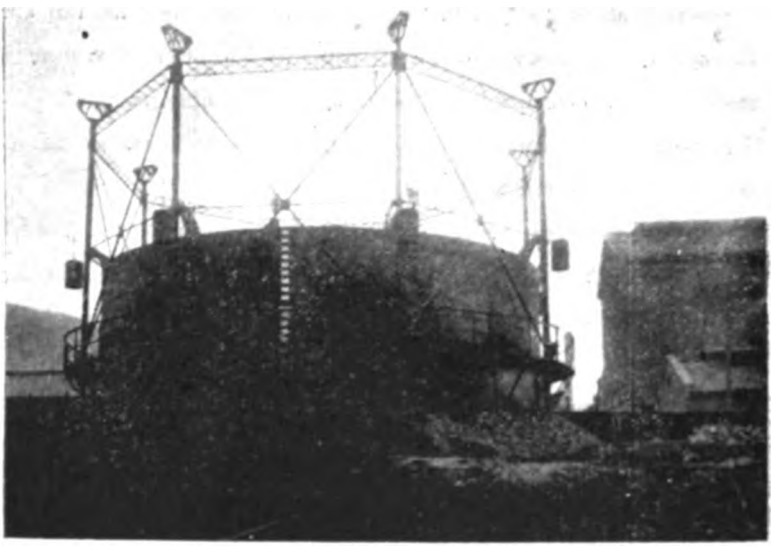
If the market should manifest a sign of gradual ascent, the selling policy may still be kept up, and the previous sales at the lowest rate might be "bought back" at a suitable juncture, to be sold again as the tone has improved.



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On the contrary, if the market should decline after the "buying-back" has been effected, still it may be possible to sell it again on terms better than the previous price.

Naturally the loss to be entailed will be only light. And, to an old hand on the market, any such exigency to bear a loss under above mentioned circumstances may be a matter of rare occurrence.

If the market condition should become aggravated after the stock in question has been originally sold, it may be bought back at a figure held as the minimum, so as to gain the profit thereon keeping the goods till they may be disposed of when the price improves.

Of course, the interest on the money, storage charge, etc., must be reckoned with, but these may be covered if there be left a margin of say, 2 per cent a piece for the period of a month. So, even in the event of a further fall in price taking place on the market after being bought back, in many cases, the results will turn

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out anything but unfavourable, compared with the reactionary rise on the market.

Secondly, the Chinese bean mills, always in possession of Spot goods, are advantageously situated to sell on speculation.

Therefore such sales on speculation are indulged in whenever the market tone gets threatening, and the more such sales are conducted, the worse will the market temperament become. Then, the moment will be chosen for buying back at the lowest rate, clearing a very fat profit between the figures.

In this respect, the money power held by the Japanese buyers taking delivery of Spot goods will be found quite potential enough to bring the sellers down on their knees.

With a heavy loss incurred already to oppress them, the Japanese buyers will note with dejection their money power, by which the Spot goods are taken delivery of, is bereft of any stirring or counterbalancing influence. Even in case of the taking delivery of the goods being effected, if the interest money, storage charges, etc., until the price obtaining at the time of purchase is regained, are reckoned up, it will be only another instance of "Much ado for nothing."

When we look into the cause of the common disgust among the Japanese dealers on the Produce market of Dairen, with particular reference to Bean Cake, as voiced in the familiar execration, "Tricked again," they are found to be handicapped with the following disadvantages: –

1. Accumulation of the greater portion of Manchurian Beans on the Dairen market.

2. Existence of the majority of the bean mills also at Dairen.

3. The fact that most of the mills belong to Chinese management, the Japanese being engaged mostly in export business.

Because of the above mentioned facts, on the Bean Cake market at least at Dairen, the Chinese and the Japanese are nearly always divided between the Bear's and the Bull's camps, and the Japanese handicaps are too often exposed to the full glare of light, thereby affording chances to the "Bears" to make the "Bulls" dance to their own music.

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The characteristic advantages enjoyed by the Chinese dealers are principally as follow :—

1) The Chinese can unite very solidly whenever it concerns the main chance.

2) They have comparatively ample funds at command.

3) They are shrewder to tell any change in market tone.

4) They are bolder plungers.

Moreover, the Chinese being proverbially devotees of Mammon, they are readier to show reluctance to sell when the tone stiffens and to sell extensively as the price weakens. This will always place the Japanese at a disadvantage, cutting down the profit and magnifying the loss.

Their plight, once the financial market be overtaken with a serious shock, would be shuddering to contemplate.

Let us now trace how the bean milling industry of Dairen has come to prosper so.

1) Even before the Russo-Japanese War, the Chinese had been engaged in bean milling work, although on a very modest scale, at Yingkou, Antung, etc., and had acquired more or less experience in this industry.

2) The Chinese who have financed the Chinese bean mills at Dairen are mostly Shantung people. The geographical proximity of Dairen to Shantung has proved a strong inducement to them to invest.

3) The Japanese authorities having followed the policy of cultivating Sino-Japanese amity, they have welcomed the Chinese and have even furnished facility to such as have set themselves up in milling business.

4) The Chinese can operate a mill at a cost very difficult for the Japanese to compete with.

5) Prior to the great World War, there were only a small number of the first class Japanese capitalists such as the Mitsuis (Santai Mill), the Okuras (Nisshin Oil Mills), the Kuharas, etc., who had a good hang of the trade. As to the others, they have come after the Russo Japanese War with practically empty hands.

From the above mentioned causes, the Japanese have had to compete at a handicap from the very beginning.

I should like to suggest to the Japanese exporters, as a means to protect their business interests, the necessity for them to run their own oil mills at the same time.

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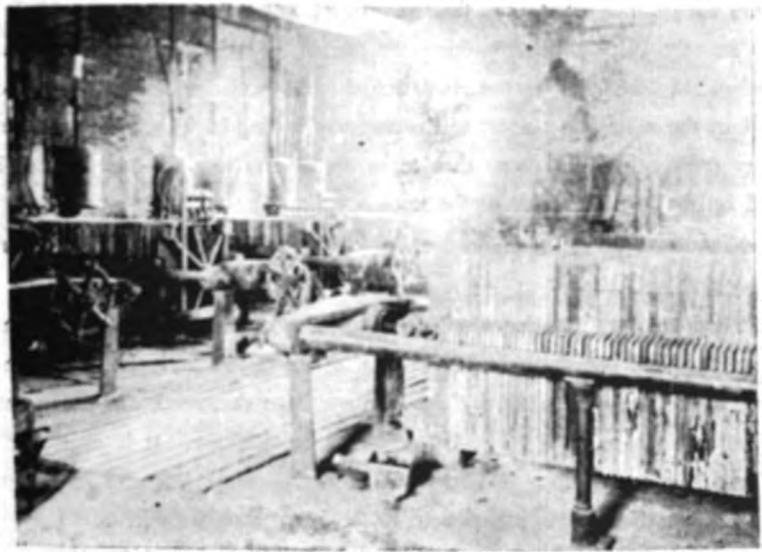
By so doing, the disadvantages, under which the Japanese have been labouring hitherto, may be remedied, and they will be put in a more favourable position to compete.

Our point of view is founded on the following grounds:—

1) Exports may be made on the basis of the producing cost.

At present, the exports are being made on the bases of the quotations on the Dairen Produce Exchange. Therefore, the prices on the markets in Japan are usually fixed close to the sum of the Dairen price and freight, Customs duty, and other incidental expenses. The markets at Dairen and in Japan being drawn to each other so near, there is hardly any margin of profit left, offering but little incentive for trade. Naturally such a state of things will pander to the speculative inclination.

But, if a mill is maintained, so far as one's own product is concerned, the quotations on the Exchange need not be made basis of its price, but instead the price may be fixed on the bases of the price at which the beans have been bought.



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In case of the market condition happening to be unfavourable, the scope of operation may be reduced at any time, since only a small gang of Chinese labourers

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hired at comparatively low wages is employed, with the object of waiting for the price to improve. Once the market becomes negotiable enough, the sale of the output on the Japanese market or anywhere else offering a better inducement may be chosen at one's option, thereby the risk of the future being narrowed down and a reasonable profit being realized.

2) Freedom from a loss resultant from the fluctuations of the market, a profit instead being cleared on the contrary.

As at present the bean mills are arrayed on the selling side, and the Japanese exporters on the buying side, whenever there is a sign of a prospective rise, the mills will betray a reluctance to sell, naturally creating an eagerness to buy among the rival buyers, which will only tend to stiffen the tone.

Again, the sellers, as a rule, sell as much as they have put out, either supported with stocks on hand, or merely in speculation. Thus, a possible rise from such speculative sale is usually very limited, and the profit to the buyers can never be large.

On the contrary, supposing that the market falls, the sellers, provided with stocks actually, can easily press down the market by indulging in speculative sales, and when the bottom is reached, both actual and speculative demands being bound to appear, the sellers may resort to the tactics of buying back their bargains, netting an easy profit, which will more than make up for any loss that may have been caused by the lowering price of the stock.

3) Adjustment of silver fluctuations on the Currency Market against the Chinese side.

Heretofore, the Currency Market of Dairen used to be led by the exchange market, Shanghai, but since the introduction of the Gold Standard on the Exchange at Dairen, the deals transacted by the Japanese have decreased, and the quotations on Silver notes have come to be controlled by the Chinese. It is often that the local market takes an opposite turn to the Shanghai temperament, and its baneful effect has proved a serious impediment to the local produce business.

But in case of the Japanese exporters keeping bean mills of their own, the business done by the Japanese on the Currency Exchange is sure to increase, seeing that silver capital is more or less required for the purchase of Beans. This will help substantially to rectify any unnatural fluctuations of Silver.

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4) The Chinese boycott may be restarted.

For the above reason, the tendency of the Japanese to wait on the sweet pleasure of the Chinese in both export and import trade may be checked.

Still, the handling of the Japanese exporters on the additional enterprise of loan milling will mean entry into the arena of competition. Of late, in both Japan and in Manchuria, loan milling appears to have grown more popular. If left to free competition, the new mills will be exposed to difficulties, and they may be forced into the tools of sharp competition, encumbered with surplus production.

Therefore, we should look for capitalists of powerful means to embark on this line of industry. Then, special financing facility may be provided by such banks as the Bank of Chosen, the Yokohama Specie Bank, the Oriental Development Co., etc.

However, the lower standard of living of the Chinese and the consequent lower cost of operating the mills, on top of the possession of experience of years, and also of ample means, which advantages are enjoyed by the Chinese, should be borne in mind.

A Japanese capitalist intending to interest himself in loan milling business at Dairen, etc., should firstly be provided with comparative plenty of funds. He will have to invest a large sum of money in acquiring the site for the mill, building the mill, and buying machinery, etc. At the same time, he must have a liberal amount of working capital if he means to weather the competition and to succeed. In addition to liberal means and a sound reputation, he should be equipped with business ability in a suitable measure and also experience in handling staple produce.

Secondly, the standard of living should be brought down to the level of the Chinese rivals in the management of his mill. For, the higher cost of living of the Japanese has in many cases raised the operating expenses, making the enterprise anything but commercially workable.

It might be expedient to engage some capable Chinese, highly qualified, as manager of the mill, placing him over the whole staff of the junior officials, factory hands, etc., who ought to be entirely Chinese. The Japanese proprietor may remain contented to be the real controller of the general business policy.

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Speaking of what is called Sino-Japanese joint management, the name itself sounds agreeable, but the disparities in the racial characteristics, etc., will be found too wide to be bridged over easily.

price may be fixed on the basis of the price at which the beans have been bought.

MANUFACTURE OF HARDENED OIL IN MANCHURIA.

By Mr. T. Ishikawa,
of S. M. R. Co. Commercial & Industrial Office.

I.

The object of manufacturing hardened oil consists in taking off fat or fatty acid of semi-drying nature containing much unsaturated acid such as cocoanut oil, fish oil, Bean Oil, larva oil, etc., and in raising the degree of hardness, so as to make it a suitable material for making soap or food-stuffs.

Hitherto, hardened oil has been represented almost wholly by tallow, but this article is obtainable only through the slaughter of live cattle for food purposes. The demand for hardened oil in the world and the propagation of live cattle cannot keep pace, and shortage of hardened oil has been brought home forcibly to the consumers year after year. "Necessity being the mother of wisdom," as the Western aphorism runs, means have been invented to harden vegetable oils artificially, and this very industry has now developed into one of world wide importance.

Consequently, the demand for the oil to be so hardened has increased by leaps and bounds, and even the United States, which is a great producer of cotton seed oil, not to mention Europe, which is in no sense an oil-producer, is importing all available oils for material.

In short, fact stands out conspicuously that shortage of animal oil is being supplied with hardened oil and that neither animal nor fish oil can be increased in production with no such ease as with vegetable oils. Therefore, the future of hardened oil to be produced from vegetable oils is a question of predominant interest in the oil world.

The manufacture of hardened oil has advanced the farthest in Great Britain and Germany. Also, in Russia, France, Holland, Switzerland, Italy, etc., there are factories of hardened oil of various kinds.

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This particular industry has taken remarkable strides in the United States, which lagged behind the others prior to the War, but pushed ahead at a marvellous pace during the War, while the others were totally engrossed in the colossal hostilities directly or indirectly. As a matter of fact, the American manufactures dominated the oil market at London during the War.

On the other hand, Manchuria, as a great producing centre of vegetable oil, has been drawn to closer contact with the world's oil markets year by year with its producing capacity increasing steadily also. And yet, the port of Dairen, which itself is an extensive oil market, has only oil mills and factories worked on comparatively out-of-date systems. Speaking of oil and fat industry, the only plant existing is the Dairen Fat & Industry Co. This is more because of lack of interest in chemical industry and failure to master its knacks than due to the consideration of its economic feasibility.

Below, we shall dwell on the future of hardened oil in Manchuria on the basis of the opinions held by the few specialists who have made a study of the theme.

II.

The total annual outputs of Beans in South and North Manchuria are roughly put at about 2,000,000 tons, all of which, if appropriated for making oil, can produce only about 190,000 tons. The whole of this might be hardened, but the output would be merely about one twentieth of the world's entire requirements, which are about 4,000,000 tons.

It is most apt to launch the manufacture of hardened oil in Manchuria, the richest centre for Bean Oil.

Especially, Bean Oil makes the economically unexcelled material for making hardened oil, and the port of Dairen, which may haven a immense quantity of Bean Oil at command, will be just the place to be a seat of manufacture of hardened oil.

As might be well expected, the founding of any industry is beset with difficulties, particularly in its initial stages. The removal of these difficulties will mean the facilitation of its development.

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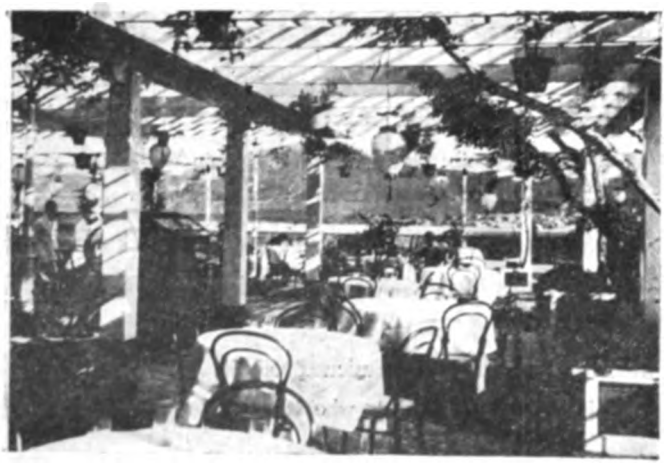
It behoves the authorities concerned not to grudge necessary protection and encouragement to the growth of an industry of so world-wide importance as hardened oil industry.

The present output of hardened oil in Manchuria fills only one-thousandth part of the entire consumption of the world. In spite of the demand for fatty acid as material for soap, candles, etc., increasing at a rapid pace in the world, this most promising enterprise has made but little progress in the Orient, and our wants had to be imported mostly from the West in the form of hardened oil. As an effect of the great War, its supply was stopped, and this stimulated the Japanese to rise to the occasion, and the export of oil products to China, India, the South Seas, etc., was conceived and taken up, and now they have managed to lay a foundation for the oil industry to bid for the world's oil market.



Yamato Hotel Roof Garden, Dairen.

Now, the Japanese might look to the West for the supply of hardened oil, but the Westerners would much prefer sending out their stocks of hardened oil, not as mere material, but in the form of manufactures like soap, candles, etc., so as to make them compete with Japanese products in the Orient and the South Seas.

Therefore, it is but proper for us to avail of the natural and other advantages enjoyed by the port of Dairen for this line of activity.

Especially, in Manchuria, not only Bean Oil is available in a liberal quantity and on comparatively moderate terms, but also such materials as are required in carrying on the oil industry, inclusive of lime, table salt, and soda, are found in

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abundance. Moreover, as there are ample railway and steamship facilities, the transportation of both materials and products, the latter to the markets in China, Siberia, India, the South Seas, Japan, etc., is greatly facilitated. The indigenous products are at an advantage in point of freight cost, over the Western products made by hydrogenating crude oil imported from the Orient and by being subjected to technical operations.

According to the Imperial Customs Returns prepared by the Ministry of Finance, the import statistics for various kinds of fat and products in Japan are as under:—

Import Returns of Hardened Oil and Kindred Oils.

a To Japanese.

	1915		1919	
	Yen	Yen	Yen	Yen
Tallow	2,231,858	1,157,317	6,314,471	1,380,760
Paukwenia Oil & Wooden Wax	175,278	68,120	115,915	27,045
Animal fat	43,453	6,440	650,672	178,975
Soap (scented)	50,886	44,318	104,356	103,277
Soap, etc.	34,500	57,050	155,512	2,250
Stearin	208,837	70,670	431,055	128,134
Glycerine	506,915	278,553	800,850	66,650
Fat & Wax & their products ...	17,320	28,170	36,402	71,432
Other fat & wax & their products	unknown	281,084	unknown	471,735
Butter	41,524	8,630	33,181	27,968
Total	3,868,431	2,105,328	9,501,571	13,417,333

	1917		1918	
	Yen	Yen	Yen	Yen
Tallow	12,510,812	3,233,504	122,112,000	4,214,000
Paukwenia Oil & Wooden Wax ...	1,588,907	448,940	unknown	unknown
Animal fat	16,812	1,573	23,064,000	841,000
Soap (scented)	78,577	78,050	2,402,000	678,000
Soap, etc.	31,027	37,213	614,000	58,000
Stearin	450,357	180,421	2,201,000	1,041,000
Glycerine	971,316	557,158	11,030,000	5,158,000
Fat & Wax & their products ...	31,800	60,455	304,000	73,000
Other fat & Wax & their products	unknown	415,402	unknown	1,240,000
Butter	10,145	16,441	250,000	35,000
Total	15,151,378	5,859,317	182,576,000	16,377,000

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	1919	
	Kin	*Yen*
Tallow	151,626,000	4,165,000
Paulownia Oil & Wooden Wax	unknown	unknown
Animal fat	17,053,000	517,000
Soap (scented)	934,000	122,000
Soap, etc.	519,000	18,000
Stearin	1,863,000	86,000
Glycerine	4,539,000	601,000
Fat & Wax & their products	156,000	34,000
Other fat & Wax & their products	unknown	947,000
Butter	61,000	6,000
Total	176,753,000	6,406,000

(b) To China.

According to the Chinese Customs Returns:

	1917		1918	
	Picul	Hk. Tl.	Picul	Hk. Tl.
Butter	7,084	410,062	13,681	507,983
Materials for candle-making	44,891	831,740	62,631	1,035,943
Stearin	18,530	370,467	9,859	238,692
Other candle making materials	unknown	3,715	unknown	1,088
Oil wax	213 650	2,583,348	110,301	1,298,234
Glycerine	748	41,519	unknown	unknown
Soap & material	unknown	361,928	unknown	3,054,027
Total	284,825	7,922,769	196,372	6,136,876

	1919		1920	
	Picul	Hk. Tl.	Picul	Hk. Tl
Butter	7,350	341,744	10,574	537,333
Materials for candle-making	82,362	1,540,197	64,861	1,304,815
Stearin	8,874	168,014	12,089	250,910
Other candlemaking materials	unknown	15,352	unknown	0,025
Oil wax	103,272	1,258,724	156,818	2,144,887
Glycerine	2,084	74,352	2,907	106,213
Soap & material	unknown	3,329,246	unknown	3,154,686
Total	203,942	6,728,529	249,339	7,498,869

The above table will plainly show what great possibilities lie before this particular industry.

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W.

Bean milling industry, especially oil and fat industry constitutes one of the greatest industrial assets of Manchuria, and its fostering rests with the Japanese industrial community of Manchuria as a sort of a trust to improve.

Mr. T. Okada (formerly on the staff of the S. M. R. Co. Central Laboratory) applied to Manchurian Beans a chemical process worked out by himself for the hardening of oil by years of close application. In 1915, he got convinced of the promising nature of organizing the enterprise on an industrial scale. In May, 1916, a company was established for the manufacture of hardened oil on the basis of the results of his investigations.

This Company is known as the Dairen Oil & Fat Industry Co. The factory was completed practically in December, 1916, and was opened for trial operation in the following January.

Works' Head Headquarters, Star Point

The hydrogenating or hardening process itself was placed into a smooth running groove in about three months' time, and the outputs could be increased to five times the original capacity.

However, divers difficulties were encountered in technical lines as regards the appliance for generating hydrogen which forms the economic key to the oil hardening industry. It was then projected to install additionally a contrivance for electric solution, but from complex circumstances bearing on the subject, nothing beyond introducing some improvements into the old system was attempted.

However, after further experiments and study, by November, 1920, the hydrogenating process could be reorganized into an electrical solution method, and thus the same process was brought up to an almost ideal plane.

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At present, 400 tons of hardened oil may be produced a month.

From March to July, 1921, 420,000 *kin* was exported to Europe for sale on commission, and 210,000 *kin* was shipped to Japan.

However, in regard to export to Japan, an import duty is imposed at the rate of 20% *ad valorem* for such as is sent via Dairen.

For the Company's product, the principal market in view is Europe, but when thought is taken of perpetuating the export business, the establishment of the business relation should be properly deferred, till a sufficient amount of confidence has become begotten in quality of the manufacture and the manufacturing capacity.

Again, the business dullness in Europe has awakened little demand for hardened oil, and so the export amount in that direction has been very meagre. But once an economic revival has set in, we shall be in a position to supply hardened oil on much the same terms as Bean Oil on the Western market. Therefore, this industry may be considered to have a very rosy future.

As above stated, a great deal of pains and even sacrifice has been laid out for improving the hydrogenating process to the present state of high efficiency, and, in respect of both quality and output amount, a stage was attained, at which self-confidence may well be entertained therein.

Notwithstanding, the financial stringency and general business depression ruling since 1920 have produced an untoward effect upon the growth of this Company's undertaking. And yet, revival of the hardened oil market will not be a contingency of the distant future, and a hope for the better is being clung to.

As already stated, manufacture of hardened oil forms one of the most important industries of Manchuria.

Supposing that this line of industry is taken up in good earnest, the question is whether it should be founded in Manchuria or in Japan. It seems that, with all the advantages attributed to Manchuria, it still compares unfavourably with Japan. This contention is grounded chiefly on the point that it is intended to export the output to the West, and, if, as China is opened up, a demand should be created therein for hardened oil, the prospects for this enterprise would be far rosier.

Now, we will compare Manchuria with Japan from a point of view of the manufacturer.

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Firstly, as advantages for Manchuria, we may count (1) that Beans are to be had in large quantities, and (2) at moderate prices; (3) that Beans of the desired quality may be procured; (4) that any necessary amount of Bean is obtainable, at all times of the year, and (5) that fuel can be had for motor power at comparatively easy rates although at a disadvantage, when compared with the utilization of hydro-electric power.

However, Manchuria has, at the same time, its own handicaps, including such disadvantage as (1) in installing the necessary equipments for a mill, and also in respect of engaging technical talent; (2) in feeling more or less inconvenience in the export of the outputs, liable to cause a delay in shipment, and (3) the necessity to forward Bean Cake to Japan.

The greatest advantage enjoyed by Manchuria is that the materials are obtainable cheaply, for the manufacturer in Japan has to bear the undermentioned Customs tariff, together with the freight and other charges:—

Customs tariff	70 sen per 100 *kin*	¥2.50 per case
Dairen-Kobe-Osaka freight agreed between S. M. R. Co. & O. S. K. ...	14 sen	10 sen per sai
Charges on Dairen Wharves	50 sen per ton	20 sen per 40 sai

In addition, an export duty of 6 *sen* (Hk. Tl.) per 100 *kin* for Beans and 30 *sen* (Hk. Tl.) per 100 *kin* for Bean Oil is charged, in addition to from 15 *sen* to about 20 *sen* per ¥100 for insurance premium.

Prior to the call of steamers on European and American lines at Dairen, the exporters at Dairen had to ship the stock necessarily to Japan before consigning the same to its destination, or else a steamer had to be sent specially for the purpose.

But, now this drawback has been removed.

The above has made only a comparative review of the conditions obtaining in Japan and Manchuria.

In the industrial world at large, the competition in procuring materials is bound to become keener, and hydrogenation of Bean Oil in Manchuria, which occupies a safe and convenient position in competing in this respect, will be destined to be situated at a greater advantage over the kindred industry in Japan.

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TANTALUS FROM BEAN OIL.

By Mr. H. Komatsu,
Works Manager, Solite Manufacturing Co.,
Dairen.

(I) How Water-Proof was Invented.

What loss and damage was sustained from the annual rainy season in South Manchuria was considerable. In particular, the damage done to the dwelling houses was felt more forcibly.

When nasty rain continues from day to day and the air indoors is damp and heavy, making the clothing and furniture mouldy, the health of the inmates is menaced, and moreover the perishables under the same roof will get decayed faster, while the other articles, too, will be liable to deterioration. The durability of the building itself will be affected. In the more frigid climate, the moist absorbed by the building will get frozen, and the menace to hygiene and the durability of the contents will be larger.

A Bungalow, Hokkaido.

As the architectural Japan advanced, the above point received more serious attention, and water-proofs of various kinds were imported in succession, and even in Japan, kindred articles were manufactured.

These water-proofs may be divided into two kinds, one resembling soft mud in appearance and the other in the form of powder. The pelitic kinds used hitherto do not form an emulsion even when water is applied thereto. If this is used to knead pocement with, the cement and the calcareous substances will not

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often get mixed well. Moreover, in many cases, impurities such as calcium salt, etc., which have no waterproof properties, are contained, and this detracts much from the efficacy of the mortar.

Next, as to waterproof of powder form, they are more convenient to carry about and to keep in storage, but when it comes to the point of practical use, it is found rather difficult to mix the calcareous substances in the large quantity with the powder-proof in the small quantity as specified by the manufacturers. Moreover, the powder is liable to float up to the surface of the water. If kneaded up with water, some of it which has once got mixed well float up again to the surface to be properly dealt with. It will not get mixed well as in the other case, no little to the cost of its efficacy.

The materials for these waterproofs are obtainable at reasonable prices anywhere. Still they are sold on almost exorbitant terms, which drawback prevented them from being used more extensively.

It was under these circumstances that Mr. T. Suzuki, then in the service of the South Manchuria Railway Company, succeeded in inventing from Bean Oil put out in Manchuria in an immense quantity Tantalus, a waterproof, comparatively cheap, simple to apply, and always effective.

II. Properties of Tantalus.

The chief constituent of Tantalus is fatty acid of aluminium, and it is a liquid of pale yellow, somewhat viscous, giving a very weak alkaline reaction to litmus paper.

When mixed in water, it readily forms an emulsion. If this Tantalus solution is used instead of water in kneading up cement, mortar, and other calcareous substances, the particles of cement, sand, and lime are enveloped by fatty acid of aluminium which has a strong repelling power against water, and so once the mixture has grown hard and got dried, the permeation of water among the particles will be absolutely stopped. Besides, mortar is not at all coloured.

III. How It is Manufactured.

Take some drying oil or semi-drying oil, or the fatty acid obtained from such, then apply it to a diluted caustic alkaline solution heated up to about 100°

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C., to make it fully saponified. Add to this a sufficient quantity of alum, sulphate of aluminium, or acetate of aluminium or such like in the form of a liquid solution, to change it into an aluminium salt. Stir and leave it alone, and it will give a precipitate of fatty acid of aluminium, resembling soft sponge. Gather this and wash it with water several times.

To make an emulsion by applying water to aluminium soap, the substance forming corpuscles must be a fluid or a semi-fluid. What is manufactured from a non-drying oil or fat, which is a popular soap material, cannot be liquidized unless some organic catalyzer, such as phenol, etc., is applied. For, as fatty acid rises in the degree of unsaturation, it acquires liquidity, and aluminium salts of fatty acid that make up semi-drying and drying oils, are best suited to the manufacture of an article that will readily form an emulsion with water.

IV. Uses.

Tantalus remains effective when used for making mortar for a place where water or moisture must be kept out.

Among its leading uses, the following may be enumerated:—

Tunnels, bridge piers, wet docks, ships' bottom, culverts, embankments, reservoir, water gates, cement pipes for telegraphic and telephonic systems, sewage, artificial stone, salt fields, exterior and interior walls of different kinds of buildings, foundation work, mortar, final coating of reinforced concrete, joints, basement, roof garden, powder magazine, water tank, fences, walls, fountain, hatchery-ponds, junction of earthen pipes, well-sides, walls and floors of factories where water is always used, etc.

Especially, if reinforced concrete should absorb moisture, the steel-skeleton inside would get corrosive. The process of corrosion may not be visible, but its results will be most serious.

Although not yet supported by experience, Tantalus can resist the sea-water much better than it does fresh water. So, it may make an excellent adjunct in the manufacture of "concrete ships," which were built in a good number in the West in the latter stages of the War.

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V. Characteristics.

As already mentioned, Tantalus, when water is applied thereto, readily forms an emulsion, which constitutes the most important condition for mixing well the waterproof with the calcareous substances and for ensuring their efficacy, and makes a characteristic possessed by it alone.

That fatty acid of aluminium owns a waterproof property is well known, but how to make an emulsion by applying water is not known so well. Too often phenol or some other organic catalyzer is applied to aluminium salt made from some non-drying oil, and by adding some soap and water thereto, an object barely giving an emulsion has been obtained. The product had by this method has an offensive smell and is besides expensive, unfit for architectural use. This necessarily narrowed down the scope of its utility, and was used with mortar subject to varied restrictions.

Bathing Ground, Hoshigaura, Yamato. Hotel up in the centre, with Bungalows on the left.

It is since a more simple way was devised to make an emulsion that this product has come to have its efficacy raised as high as desired.

Perhaps the unnecessary impurities have been mixed in hopes of making the emulsion as near as possible to the requirement. Still, in both shape and efficacy, the product cannot hold a candle to Tantalus, which contains no such meaningless impurity while containing a far higher percentage of the efficacious constituent. Besides, it is ready to get mixed with the calcareous matters in an even way, making it most effective as waterproof.

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The moderate price of Tantalus is another characteristic advantage. It is one-fifth of its Western likes and one-third of the cheapest of the Japanese manufactures of the kind. Of all the varieties now on the market, it is indeed the cheapest.

Again, Tantalus causes no harmful action to the coagulation of cement. So it affects in no wise either the bearing or the tensile strength of cement and mortar.

Tantalus retains its original power as long as the building to which it has once been applied remains standing, for fatty acid of aluminium does not deteriorate of itself.

VI. How Much and How to Use It.

The quantity of Tantalus to be used varies more or less according to the kinds of the works and also the degree of the hydraulic-pressure.

From experience of several years, for mortar for the basement, foundation work, reservoir, and other places subjected to strong hydraulic pressure a liquid solution of 3% of Tantalus is used; and where the hydraulic pressure is weaker, such as underneath the floor, ceiling, etc., a liquid solution of 2%-2½% of Tantalus is applied.

For lime mortar, half the quantity of water required is used for dissolving *tsunomata* (Chondrus elatus), *funori* (Gloiopeltis glue), etc., while the other half is used for making a 4% Tantalus solution. The two are put together and mixed and kneaded up well.

The quantity of Tantalus to be applied to articles having different degrees of dissolution are as under:—

Quantity of water	Solubility	Quantity of Tantalus required
40 lbs. (1 to)	30 times	1.33 lb.
"	35 "	1.14 "
"	40 "	1.00 "
"	45 "	0.89 "
"	50 "	0.80 "
"	55 "	0.72 "
"	60 "	0.67 "

In order to make a Tantalus emulsion, take a required amount thereof; stir it well, put a very small quantity of water; stir it again and when it has got mixed well, add a little more water, stirring it each time; and when the solution

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has begun to become like thin cream in appearance, more water may be added. No large amount of water should be applied at a time at the start. In cold weather, hot water may be used with fine results at the beginning.

Mortar, etc., for which a Tantalus solution has been used, should be given a liberal amount of moisture until it coagulates, as in the case of such as contains no Tantalus solution, for only after the mixture has got coagulated and dried, it will become efficacious as waterproof.

Care ought to be taken to see that the water to be used shall be always soft water; that sand not more than 4 times the cement shall be used; and also that no hole or crack shall be allowed to appear in the mortar, for, let the waterproof be efficacious as it may, there will be no stopping water running into any hole or crack.

VII. Results of Testing.

In a testing held over a piece of cement mortar, to which Tantalus was applied, by Mr. S. Kimura (a specialist on the staff of the Central Laboratory of the South Manchuria Railway Company) in December, 1915, the showings given as regards the time wanted for coagulating, tensile strength, and bearing strength, and a crack generated by expansion, are as under:—

1) Time wanted for coagulating.

at 22° C

	Sample A	Sample B	Sample C
	h.m.	h.m.	h.m.
Beginning of coagulation ..	3.55	3.40	4.0
End of coagulation ...	6.15	8.15	8.44

Note: Sample A had 23% of fresh water put in 100% of cement in weight; Sample B had 23.8% of Tantalus diluted 50 times; Sample C had 24.3% of Tantalus diluted 35 times.

2) Tensile and Bearing Strength.

In kilogramme per square centimetre

a) Tensile Strength.

After	Sample A	Sample B	Sample C
7 days	21.3	24.5	30.4
28 days	17.6	24.0	26.8
90 days	18.5	24.1	28.4

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(b) Bearing Strength.

After	Sample A.	Sample B.	Sample. C.
7 days	110.5	104.3	107.5
28 days	170.3	165.8	170.8
90 days	194.5	256.5	202.5

Note: Sample A was made from 1 cement to 3 standard sand, with 7.7% of fresh water applied; Sample B, made alike, had 7.9% of Tantalus diluted 50 times applied; Sample C, compounded likewise, had 8.1% of Tantalus diluted 35 times applied.

Senshokan Restaurant (Summer Pavilion) Rokotan Seaside. In the suburbs of Dairen.

In all above cases, mortar was made according to the directions for testing Portland Cement, as laid down by the Ministry of Agriculture and Commerce, and it was then soaked in fresh water.

(3. Crack Generated by Expansion.

A suitable amount of fresh water, a Tantalus solution diluted 50 times, and a like solution diluted 35 times were separately applied to cement, in accordance with the directions for testing Portland Cement of the Ministry of Agriculture and Commerce. The different kinds of mortar made as above mentioned were subjected to a boiling and a submersion test. Nothing particular was observed in any of these cases.

Note: The cement used in all the above tests was manufactured at the Chokshitzu Factory (near Dairen) of the Onoda Cement Co., which has passed the Portland Cement test of the Ministry of Agriculture and Commerce.

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At the Dairen Branch of the P.W.D. Works Office of the Government General of Kwantung, a test regarding the resistance of Tantalus to hydraulic pressure was conducted.

In conducting the test, cement mortar was kneaded up with a Tantalus solution, and it was made the bottom side of a metallic cylinder.

Then water was sent into the cylinder through a hydraulic gauge to see if the water leaks.

	1 cement 1 sand mortar	1 cement 2 sand mortar	1 cement 3 sand mortar	1 cement 4 sand mortar	1 cement 5 sand mortar	1 cement 6 sand mortar
Tantalus (Cement mortar)	3 grains	"	"	"	"	"
Hydraulic pressure	50 lbs per sq. inch	"	"	"	"	"
Tantalus % to fresh water used	1 %	1 %	1 %	1 %	1 %	fresh water
Leakage per minute	Nil	Nil	Nil	Nil	Nil	17 grammes
Note	No leakage for 7 days	"	"	"	"	Began to leak in 30 minutes

From the above test, the following deductions may be drawn:—

a. Tantalus, irrespective of hydraulic pressure, has a waterproof property.

b. Cement mortar made by use of Tantalus, compared with what was made with fresh water, takes a longer time to get coagulated, but once it has got coagulated, it is found to possess tensile strength as high as any of its kind, and, as to bearing strength, too, it compares favorably with any other kind.

c. Tantalus and cement produce no harmful effect on each other.

VIII. Remarks.

Tantalus may be produced to the annual total amount of 500,000 600,000 lbs. per annum and is manufactured and sold by the Dairen Slate Manufacturing Co., Ltd., Dairen.

The price obtaining is Y30 c.i.f. Dairen, per 100 lbs.

Its chief markets are Japan, Chosen, Formosa, Shanghai, Hongkong, South and North Manchuria, China, etc.

Export to the United States is now being planned.

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WHALE FISHERY IN KWANTUNG LEASED TERRITORY.

By Mr. T. Sawada.

The Whale fishery in the Kwantung coast waters has never been more than on a limited scale. The only fishing ground is about Haiyangtao Island situated at 77 miles due east of Dairen, as operated by the Oriental Whale Fishery Co., Osaka.

The Chinese have had an indefinable fear of the whale as one of the monsters of the sea and have left the mammal alone.

In 1914, The Oriental Whale Fishery Co., Osaka, applied for, and was granted, permission by the Government General of Kwantung (now the Kwantung Government) to engage in whale fishery and opened a fishery station on Haiyangtao Island, commencing the fishery operation in 1915.

At the start, whales could be captured in the neighbouring waters of Haiyangtao Island and the Elliot Group (the Changshan Islands). In recent years, fewer whales have been noted to visit these coast waters, and now not one of them is said to be visible any longer within fifty or sixty miles of Haiyangtao Island. Whales move about in quest of tiny shrimps (Neomysis japonica), sardines, etc. on which they feed, and small wonder that the mammal should keep off these coasts, in which these small fish have been caught quite recklessly.

The fishery returns of the Oriental Whale Fishery Co., since it began operation in 1915, are as under:—

Whales Captured.

	1915	1916	1917	1918	1919	1920	1921
January	—	12	1	6	1	1	—
February	—	2	2	2	1	—	—
March	—	29	8	23	5	2	—
April	—	54	51	39	36	19	23
May	9	29	59	39	14	23	16
June	9	14	37	39	23	3	3
July	—	—	—	6	—	—	—
August	—	—	—	—	—	—	—
September	—	—	—	—	—	—	—
October	1	—	—	—	—	—	—
November	8	10	17	5	—	—	—
December	21	6	7	2	2	—	—
Total	48	156	182	155	82	45	42

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The majority of the captured were sulphur bottom whales, and there were only one or a couple of the humpbacks or the sperms during one whole season.

Norwegian whalers, ordinarily of 100 tons or so, have been used. They have a speed of 10 nautical miles per hour and have a mortar of some 5 inch calibre mounted on the bow.

The whalers exploiting the Kwantung waters are mainly the *Tai Maru* and the *Jinzu Maru*, manned as under:—

	Tai Maru No. 1 (100 tons or so)	*Jinzu Maru* (100 tons or so)
Captain	Capt. Y. Kodama	Capt. A. Goda
Chief engineer	Mr. Fujimoto	Mr. Nakamori
Gunner	Mr. Larsen	Mr. Davidsen
Cookswain	'a Norwegian 1 Japanese	'a Norwegian 1 Japanese
Sailors	2 Japanese 2 Koreans	1 Japanese 3 Koreans
Chief stoker	1 Japanese	1 Japanese
Stokers	1 Japanese 1 Korean	1 Japanese 1 Korean
Oilers	1 Japanese	1 Japanese
Cook	1 Chinese 1 Japanese assistant	1 Korean 1 Korean assistant

Formerly, all gunners of whales used to be Norwegians, but some Japanese have acquired skill by degrees and now, of the nineteen gunners in the service of the Oriental Whale Fishery Co., eleven are Norwegians, and the remaining eight Japanese, there being very little to choose between them as far as their efficiency is concerned.

Kwantung Government House.

To quote the actual working returns of the gunners of Nowegian and Japanese nationalities for the former half of 1920 (from February 1 to July 31st.

By thirteen Norwegian Gunners.

	Feb.	Mar.	Apr.	May	June	July	Total
Right	—	—	—	—	—	—	—
White sulphur bottom	1	3	1	—	—	1	6
Sulphur bottom	8	19	20	28	25	70	170
Humpback	9	10	5	1	1	1	27
Sperm	4	1	—	—	1	5	11
	—	2	—	1	37	16	56
Total	22	35	26	30	64	93	270

By Ten Japanese Gunners.

	Feb.	Mar.	Apr.	May.	June	July	Total
Right	1	—	—	—	—	1	2
White sulphur bottom	1	5	—	—	1	2	9
Sulphur bottom	1	3	14	2	8	42	70
Humpback	2	21	8	2	—	7	40
Sperm	2	6	2	4	17	17	48
	—	1	1	7	10	31	50
Total	7	36	25	15	36	100	219

The harpoons used in the whale fishery are made of iron. They are about four feet in length, and each has a ring at an end. Each consists of two square pieces of iron, having at the other end two hooks fastened with hemp cords. There is a ring having a short chain lower down. At the end of each harpoon is fastened tightly by a screw a cast iron shell stuffed with gunpowder. This harpoon is inserted into the gun. To this chain is tied a strong hemprope, a little over 1 inch in diameter and about 80 yards in length wound in coils. These coils are laid on an iron plate on the bow underneath the gun, and are tied so as to prevent them from falling off. The end of the hemp rope wound in coils may be tied to a hawser, hundreds of fathoms long.

A whaler has a lookout tower on the mast head. Two men are kept on the watch on the tower at a time, to be relieved by turns. They are to keep a sharp lookout for a sign of a whale. As a whale is sighted, the gunner will be signalled to, and the whaler will be steered in the whale's direction. The sensitive mammal will scent danger and disappear, but it has to come up to the surface once every five minutes to breathe. So, a guess is made as to what point the mammal may reappear at, and the vessel is brought within the firing range of

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from 60 to 80 yards of the whale, and then the harpoon is fired away. When the projectile takes effect, the harpoon will penetrate the body of the whale and the shell at the extremity will explode, battering the bone and flesh. At the same time, the hooks will open inside and sink their flukes deep in the flesh. Seriously wounded and crippled, the whale will writhe in the water in a deadly struggle to extricate itself from the harpoon with its terrible force, the whaler, holding fast on to the mammal by means of the hawser, which will be paid out. Soon the whale will get exhausted and cease its frantic struggles. Then, the hawser will be hauled in. As the whale gets sufficiently near, a boat will be lowered, and a rope will be tied to the tail, and the prize will be towed to the fishery station.

In case of a whale being captured, the crew of the whaler, together with those who have taken part in cutting it up at the Station on shore, are, as a rule, awarded rewards at a specified rate. For instance, the gunner gets Y40 per whale, the master Y10, etc.

The Cutting-Up Station is from 50 to 60 nautical miles distant from the fishery grounds. While a captured whale is being towed, the whaler's speed is reduced by half, and it takes it over ten hours to get home. As there is a fear of the meat of the whale getting its quantity impaired, a cut is generally made in the belly of the whale, while still at the fishing ground, so as to let out the warm blood.

Hitherto whales have been captured from August to the following June. But, in recent years, the hauls outside the spring season have fallen off, and last year, the operation was opened in April and stopped in the middle of June. It is because the meat of whale is susceptible to decay, and with the neighbouring waters of Haiyangtao Island so far away from the market, fishery in summer is very disadvantageous from a business point of view.

Cutting-Up Station.

The cutting-up station is laid out on a tract of land of about 1,000 *tsubo* on the sea shore of Patonyintzu near the mouth of the port. On the northern side on the shore, a wooden slip is made, about twenty feet in breadth, with a gradient of some 60 degrees. The other end of the slip touches the edge of the sea-water. It is for hauling up the whale ashore. On both sides of the slip, wooden posts are

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planted in the water, and on the shore along the two rows of these posts on each side, a flooring is made of logs, each of 5 or 6 inches in diameter, at about ten feet above the flood tide. Each of the two sheds will be about fifty or sixty in floor space. Adjoining each shed a store room without a floor is made. Connecting with the western store room, a good number of large kettles are kept over earthen-ovens, to treat the oil. On the east side, a machine shed is maintained, and on a small knoll on the south side of the Station ground stands the office.

Yamato Hotel, Ryojun (Port Arthur).

The staff consists of a manager, a physician, two clerks, and forty Japanese hands.

Treatment of Meat, etc.

Generally a whaler which has caught a whale put in the cutting-up station at night. The whaler will get in, giving three long blasts, as a signal. At this signal, the officials and men, all of whom have already gone to bed, will be roused at once and don the overalls. They will be at their respective posts. Fire will be kindled on the grate of the engine, to set the machinery in motion. At dozens of places in the ground, camp-fires are made. A cable line will be paid out to the wooden slip and will be tied to the end of the rope fastened to the whale's tail. Then the whale will be hauled up the slip by means of winding up the cable by machinery. Then, the whale will be brought to the centre of the ground to be examined as to its kind, length, sex, etc., before the cutting-up operation is taken up.

The men will each be provided with a knife having a blade of some one foot long fitted to a handle, about 5 ft. in length. Incisions will be made with the

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knives in suitable parts of the whale, and into one of these cuts, a hook at the end of the cable will be put, so as to make the meat come off as the cable is wound in by machinery. The hook and cable will be used also for carrying the meat into the wooden sheds. Then, the huge body of the whale will be cut up into large pieces of meat from three to four feet, and they will be put in heaps on the log floors in the two sheds.

Then the work of cutting the blocks of meat will commence. The outer (white) meat will be cut into strips, 1 ft. long and about 4 inches wide, while the red meat will be cut into pieces about a foot square.

The whole procedure will take about a couple of hours from the beginning.

As the work of cutting up is finished, the pieces of meat will be put in large receptacles in the sheds to be pickled in salt, except the red meat which is kept in cold storage in the hold of one of the launches in the harbour. The fatty meat and bones will be boiled in the kettles to be made into whale oil. The intestines are handed over to a fertiliser company.

Most of the blood is let out into the sea, while the whale is being towed to the cutting-up station. Still there is much blood left after being brought to the station. It is good for manure, but as there is no equipment to treat it in the station, it is thrown away.

The cutting-up operation makes a strange spectacle. The catch fires give their red blazes and are fed with the fat of the whale. Young men, by dozens, who are in rubber boots, and brandish the glistening blades, cut up the huge mammal. Presently there will be little else than heaps of bones, the foul smelling intestines, and pools and stains of the blood.

The cutting-up station was opened in 1917. The proceeds returns of both whale oil and manure obtained are as under:—

	Whale oil		Manure	
	Quantity cases	Proceeds	Quantity tons	Proceeds
1917...	5,148	¥ —	1,972,550	¥ —
1918...	3,020	36,312	108,000	13,917
1919...	2,674	40,110	138,000	13,800
1920...	8,500	8,982	21,500	2,150

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Transportation.

A transport boat is at anchor near the cutting-up station, waiting for cargo to be shipped away. As already stated, the red meat is kept in cold storage on board each time a whale is captured; whale oil is put in oil cans; white meat is pickled with salt; the bones after the fat has been removed, and the residues of the fatty meat after the fat has been removed are put on board. When the cargo put on board reaches a sufficient quantity, the boat sails on a cruise to Japan. For a transport, superannuated whaler is often used and is ordinarily of about 100 tons, being capable of loading the meat, etc., of three whales.

As to the transport boats' destination, a telegraphic order will be received from the head office of the Oriental Whale Fishery Co., Osaka, at Port Hamilton on the southwestern coast of Chosen. Usually it is either Shimonoseki or Hakata.

This Year's Business Returns.

This year, the Oriental Whale Fishery Co. opened its station on Haiyangtao Island early in April and whale fishery was commenced on the 10th. This season's whalers are the *Hogei Maru* No. 3 and the *Iwazuma Maru*, whilst the transport boats are the *Kasugayan Maru*, *Olga Maru*, and *Shin-yu Maru*.

As observed above, the fishing grounds are getting farther away year by year. This has been particularly conspicuous this year, the grounds lying some 70 nautical miles from Haiyangtao Island and nearing the territorial waters of Chosen.

The whales are said to have been found in greater numbers than in a usual season, but they have been more sensitive and have proved "oily customers" to the skilled gunners.

Up to April 14, 1922, only five head of sulphur bottoms, about 57 ft. in length, had been captured.

The returns turned out more fruitful in the latter half of the month, the total hauls reaching fifteen. The showings for May and June were, however, very discouraging, only five head of whales having been caught during the period. Accordingly the season was closed earlier than usual.

At present, a whale is worth about ¥3,000 in Japan, being a sharp decline by about ¥4,000 or ¥5,000 from the latter part of last year.

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The initial [illegible] was 25 [illegible] per 100 [illegible].

Conclusion.

The total annual [illegible] of the [illegible] Whale Fishery Co. [illegible] to about [illegible] head. During the last two years, the annual totals for the Kwantung fishing grounds have been only forty odd whales. And, as there is a tendency observable for the whale fishery grounds to proceed in the direction of Chosen away from the neighbouring waters of Haiyangtao, it is thought probable that, in no distant future, not a sign of the whale will be visible in the Kwantung coast waters, and the Whale Fishery Co. will be obliged to shift its operating grounds elsewhere.

Yamato Hotel Coffee House, Ogondai (Golden Beach), Summer Resort, Port Arthur

If such is really a result of the reckless catching of the smaller fish, the matter may give food for reflection.

The Chinese have refrained from interfering with the whale from old times, and so have little interest in whale. It is true that some of them have learned to eat whale lately, but unless the price is very cheap, the Chinese masses will not be attracted thereby.

Even with the Japanese, in Manchuria where beef, pork, and fish can be had on comparatively easy terms, the sale of whale is very difficult. In Japan, too, the market for whale appears limited to west of Osaka, especially Kyushu.

The meat of the whale forms only a secondary consideration in whale fishery, for which the primary consideration lies in the bye-products.

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Neither meat nor bye-products apparently yet interest the inhabitants of the Leased Territory. However, matters standing as above mentioned, some thought may well be spent for the preservation of one of the natural resources in the shape of whale fishery.

NATURAL SODA ZONE OF MONGOLIA.

By Mr. Y. Sato,
of the S. M. R. Co. Agricultural Office.

I. Producing Zones and Scope of Enterprise.

Mongolia is a vast expanse of wilderness. Natural soda may be produced without stint. But, most part of Mongolia is only thinly populated; there is still left an immense area of irreclaimed land in addition to a wide desert land. Besides, in the more remote parts of Mongolia, there are almost no roads to travel on. The soda zone is, moreover, located mostly far from the native villages, and few visitors intent on investigation of one sort or another ever traverse the soda zone. It is partly on this account that, as regards the distribution of natural soda in Mongolia, few are known, except such as have been more conspicuous since old times. For this reason, the majority of soda zones still lie neglected.

Only, in the country along the railway, the soda industry has made fair development, and moreover, owing to the comparative travelling facility the country affords, a rough idea of what it is in such region may be learned.

The following is a list of noted places in the Eastern Part of Inner Mongolia, as prepared from sundry reports available:

Natural Soda Belts.

In Eastern Part of Inner Mongolia.

(A) Chelimu.

In Kirin Province:

Yushukang (about 20 miles east of Fuyang Prefectural Seat).

Tuerhhatu:

The soda output of this tribe is regarded as fairly plentiful in the Eastern Part of Inner Mongolia, the number of soda depots exceeding twenty. Of these

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Chaerhtu and Hsiao-Hsiotzu are best known. The outputs are the heaviest in the district about Anta on the Western Section of the Chinese Eastern Railway, and there are many soda zones south of the Railway.

Again, from a point about 33 miles south of Tsitsihar to the New River Valley, there exists a great soda belt, and all over the low land and in the swamps, there are few places where soda is not produced.

North Kooerhlowu

Soda is produced in the belt north of the extensive swampy land traversed by part of the Chinese Eastern Railway.

South Kooerhlowu: Lake Tapusu.

Sanwangpao.

This lake is situated at almost 12 miles from Tapusu in the direction of Taonanfu on the border of Chahannor and Sue in the northeast of the tribe. The lake is about 13 miles in circumference.

Halahaitotzu at the southwest of Hsinsheng and to the northwest of Tamatsu Lake.

Chienpaotzu to the north of Hsinmiao.

Hulipopao, Hulohaka, Tamahaka.

Taerhhan:

The valley along the new Liao forms a famous salt belt. Polishan-chientientzu soda field includes Almato-chientientzu, Hoshinori-chientientzu, Shinnairi-chientientzu, Ilichi-chientientzu, etc. situated from 46 miles to 60 miles from Chengchiatun on the left bank of the new Liao.

Nertohosho-chientzu, west of Poli-chientientzu on the left bank of the new Liao and at 76 miles from Chengchiatun.

Hagenmiao-chienpaotzu soda marsh, 100 miles west of Chengchiatien.

Endontou-chientientzu on the left bank of the new Liao and 76 miles from Chengchiatun.

Hagainzu-chientientzu, 60 miles from Chengchiatun.

Polohotokaya-chientientzu, 56 miles from Chengchiatun.

Major Belebo-chientientzu, 53 miles from Chengchiatun.

Minor Belebo-chientientzu, 50 miles from Chengchiatun.

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Shinnairi-chientientzu, about 5 miles northwest of Paiyintala.

Rofengtou chietientzu, 20 miles south of Kailu.

Tushihyehtu:

Hsianghaimiao-pao, at 46 miles northwest of Chanyu Prefectural seat, where the Holei Riverconverges.

Paiyinchiula-pao.

Chasakotu:

Paiyuruhaga-chienpao, 15 miles southwest of Taonan.

Ostenor Lake north of Hsianghaimiao.

Changchunling-chienpao, a mile southeast of Yehmatu, northwest of Taonan.

Enishanlu, about 3 miles east of Intojagara.

Shuangyushutun-chienpao, in Kaitung Prefecture, about 23 miles east of Kaitung.

Near Halawusu.

Sue:

Soda swamps are found scattered in large numbers north of the road to Talaiting, 3 miles east of Ankuang Prefecture.

Paomatu, about 11 miles southwest of Ankuang.

Huanghuashao, 14 miles west of Ankuang.

Kuanchiawopeng, 15 miles northwest of Ankuang.

Huhsihaka, 32 miles southwest of Ankuang.

Chalaitu:

There is a chienpao at 20 miles south of Talai.

Powang:

Kuluhan chienpao; Chierhchi-chchienpao; Huahuisantao-chienpao; Shalika-chienpao; Tungkengkeng chienpao; Pulahuchi-chienpao; Kungyehyingtzu-chienpao; Huatengyingtzu-chienpao; Ssutaokou-chienpao; Langtzutung chienpao.

(B) Chosotu.

Hsitushoutu:

Chiencha chienchang, at southwest of Chaoyang, at the foot of the northwestern foot of the Fenghuangshan Range;

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Hungyao-chienchang, on the road to Chaoyang from Chinchow to Sunglingtzu;

Hsiao-Chalanyingtzu-chienchang, at 2 miles northeast of Chaoyang;

Hsinglungkou-chienchang, at about 3 miles northeast of Chaoyang;

Pingchiakou-chienchang, a little over a mile southeast of Hsinglungkou.

Left Kolachin

Sutzukou-chienchang, about 3 miles south of Chienchang.

C Chaowuta.

Koshihkoteng:

Dolainor, a large lake near Tawangmiao at about 33 miles west of Chingpeng. It yields table salt and soda;

Paiyinpankoumen, in the Shiramoreshi Valley.

Hsiyingniutu:

Hsiyuanpaoshan-chienchang, about 4 miles east of Chihfeng.

Liutiaotzukou-chienchang, about 5 miles west of Chihfeng.

Wutaitzu-chienchang, about 3 miles southwest of Liutiaotzukou.

Naiman

Tantu-chientientzu, 20 miles south of Kailu.

Tungyingniutu, 20 miles northeast of Wutancheng. Formerly there was a soda depot.

Tapalin:

Tapa (Liangkang)-chientientzu, 23 miles west of Tapanshang.

Hsi Chalutu:

District east of Lake Taragan, at 20 miles north of Kailu.

In addition, chienpao (soda swamps) are scattered here and there in Tung-Chalutu, Alukoerhchin, and Koerhko, but none of them puts out much.

(D) Chahaerh.

Chenglan:

Valley of the Shantien River; Takushantzu; Tungkou; Kungchinor, Chahannor.

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Chengpai :

Erhtaoyingtzu ; Kaohungyingtzu ; Tachahannor ; Ta-Takang ; Hsiao-Takang ; Paiyennor ; Shihlanor ; Hotutunor ; Halipingchiahu-chienchang.

Hsiangpai :

Ichunor.

Hsianghuang :

Panliangtzu ; Katahsitan ; Erhtaowa ; Tenglungshu (Lake Paishui) ; Erhshihlinaopao ; Huashaoliangtzu.

Of the above mentioned places in the Eastern Part of Inner Mongolia, Chelimu leads the list and is followed by Chahar, Chaowuta, Chosotu, etc.

Chelimu is situated nearest Manchuria and is possessed of comparatively fair facility of communications. It has a number of noted soda fields, affording the most suitable ground for Japanese enterprise.

In Chelimu, Taerhhan Tribe takes the first place and is followed by such tribes as Tuerhhatu, North and South Kuoerhlossu, Powang, Chasakotu, Tushihyehtu, Chalaitu, Sue, etc.

The chief reason why natural soda industry has not developed faster is because of the soda fields lying remote from the highways of traffic.

Chelimu, for instance, has itself a vast area. Where railway facility is or will be available may be the first regions to be exploited by the Japanese.

In 1919, the Ssupingkai-Chengchiatun Section of the Ssupingkai-Taonan Line was opened to traffic, and now the Chengchiatun-Paiyintala section beyond Chengchiatun (70 miles in length) has been finished, and opened to traffic. The time when the whole of the Chengchiatun-Taonan section beyond Chengchiatun on the Ssupingkai-Taonan Line gets ready for traffic will not be far off, either. The change for the better that will be sure to be worked out on the prospective completion of the Railway will be wonderful.

The best known soda zone, inclusive of Tapusunor district, Chientientzu (soda fields) in the Upper Liao Valley, Paiyintala district, Powang-chientien, etc., too, is going to have the benefit of railway facility.

When the Chengchiatun-Paiyintala section is extended to Kailu, the natural soda fields in those regions will also be tapped.

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The two tribes of Tuerhhatu and North Kooerhlossu are noted soda belts in Chelimu. It is traversed through by the Chinese Eastern Railway and has communications facility, but, probably because of its geographical distance, has so far failed to interest Japanese capitalists.

Therefore, the region considered as suited to Japanese exploitation may be said to be limited to the soda belts along the Swipingkai-Chengchiatun Line, together with its two extensions, one to Paiyintala and the other to Taonan.

II. Soda Fields along the West Liao.

The narrow strip of damp low land, about 66 miles in length on the north and south banks of the New Liao forming one of the two principal tributaries to the West Liao, which joins the main Liao at a short distance east of Chengchiatun, makes a very excellent soda zone.

This zone wholly belongs to Tuerhhatu Tribe.

On the north bank of the new Liao, there lie such famous soda grounds as Polishan field, Nerhotosho, field, Hagenmiao marsh, etc. On the south bank, Yentungtu, Tzuant, Hagains, Polohotokaya, Major and Minor Belebo, etc.

At these soda fields, many soda factories, both old and new, are worked, and their outputs are placed mostly on the Chengchiatun market.

A) History of Soda Factories.

Of all the soda fields along the West (New) Liao, the oldest is on the left bank and about Polishan soda field. As early as 80 years ago, it is said that at Liangchiatzu, a few factories were founded, and their products were sent to either Fengtien (Mukden) or Newchwang (Yingkou).

There is little doubt that the above has been tapped about as early as the noted soda marsh at Taposu in South Kooerhlossu Tribe. However, as to its origin and other particulars, there exists no record worthy of credence. Then, as regards the folklore of the natives, the stories it gives are conflicting, and one cannot tell what thereof to believe.

In short, the chief natural soda fields are found in Mongolia, and those engaged in soda manufacture have all been Chinese. This will show how in old times

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when traffic facilities were stinted and the district was only thinly populated, and moreover, when the Chinese used to be under restrictions as to their entry into Mongolia, there could be no soda factory, except that the natives gathered some for themselves to fill their own or the local needs.

In the latter days of the Manchu Rule in China, when her finances were extremely straitened, the Mongolian chieftains, too, became badly embarrassed financially. In order to relieve the stress of the circumstances, part of the land under Mongolian rule, which used to be closed to external exploitation, was thrown open for reclamation and settlement. This attracted Chinese settlers. The privilege of settlement was offered to the public about the time of the establishment of the Chinese Republic, and the population rapidly increased, whilst traffic and trade, too, grew apace. In consequence, Mongolian soda which was little known beyond its borders began to be exploited all at once, and soda factories were brought into existence in succession. Naturally the market for, and the uses of, the product have become expanded even far into China. In these periods, the soda fields along the Liao have become specially developed.

A soda factory managed by a Chinese pays a suitable sum of money to the Mongolian chieftain concerned and is thereby entitled to gather soda within a specified limit at a soda field. As to the factory, it may be located either at the producing centre or at the nearest market like Chengchiatun, whereto the soda earth was carried to be refined. However, in these times, the transportation of soda earth to a distant factory has been discontinued from the consideration of the cartage or freight.

Establishment of Fishery & Soda Co.

In the third year of Hsuantung (1911), Mr. Liu-chechen (then Manager, the Trade Daily Report (奉天商務日報), Mukden, negotiated with the Chieftain of Taerhhan Tribe, and secured an exclusive concession to engage in soda industry in the Liao Valley within the Tribe (at that time, Polishan soda field only was meant) and also in fishery.

The new concern was capitalized at 30,000 taels and organized on a joint stock footing. Mr. Liu assumed the Presidency himself and invited fishermen from the outside, and also for soda gathering and refining, men of experience were

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canal. Since the capitalists who invested in the soda undertaking after negotiating direct with the Mongolian Chieftains, have been made to conduct their business under control of the Fishery & Soda Co. Each manager of a soda plant had to consult with the officials of the Company as regards the determination of the site for the plant, and the demarkation of the scope of operation. Moreover, as to the gathering of soda and fuel and other facilities in carrying on the industry, a special permission was given by the Company and guaranteed against possible encroachment by others.

In consideration of these privileges, the parties engaged in soda industry were under contract to hand over 20% of whatever outputs were manufactured as fee at the place of manufacture. The manufactures belonging to the soda plants themselves might be sold through the Company or on their own account.

The Fishery & Soda Company had thus no soda plant of their own, but depended for its receipts on the fee collectable from its clients (the manufacturers). Thus, the Fishery & Soda Co. steadily continued in business, but little development was made and no profit to speak of could be realized.

Then the great War broke out, bringing in its train a rapid increase in demand for soda and a flight of prices. This gave a promise for the future of soda industry. Therefore the Fishery & Soda Co. arranged with the Mongolian chieftain concerned to pay the sum of $ 8,000 per annum, with the object of extending the sphere of operation.

Up to that time, the Company's sphere of operation had been limited to what is known as Pehshan soda field starting from Pehshan on the southeast, going upstream along the left bank of the new Liao, and having Mihyintai and its neighborhoods for the northwestern borders.

In 1918, and thereafter, another soda field of extensive area about Nertohoshio became included also in its legitimate sphere of operation. Thus the whole of fishery and soda industry on the left bank of the Liao, about 57 miles in length, was completely acquired by the Company, aloof from exterior interference.

As the great War progressed, the demand for soda rose to unprecedented dimensions, and many a new factory was founded by arrangement with the Fishery & Soda Co. The outputs increased correspondingly, and both the Company and the manufacturers realized each a very fat profit.

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Once the War was terminated, the demand decreased, attended with a sharp fall in price. On top of all these, the soda crops turned out the poorest during several years past. This gave rise to a depression resulting in the closing of soda factories one after another.

From 1919, the Fishery & Soda Co. found that the products received from the soda factories fell short of meeting the running expenses and the franchise fee payable to the Mongolian chieftain. The Company was confronted with a deficit, and at last, by 1920, the Company relinquished the concession it had secured, and was, to all appearances, closed.

In 1920, at Nertohosho soda field, two private soda factories, the Wangyuhai and the Wanglaoyu, neither of which had connection with the Fishery & Soda Co., entered into special arrangement direct with the Mongolian chieftain concerned and carried on their business on paying S.Y700 between the two.

Soda Concern and Liaohsi Co.

The soda fields on the right bank of the new Liao have been exploited only recently, unlike those about Polishan on the left bank, as mentioned above.

The factories on the right bank were brought into being mostly after the War broke out. At Endontou soda field, more than a dozen plants were opened in succession during the War. These all lay under management of the Soda Industry Co., run very much after the style of the Fishery & Soda Co. This Company, too, was obliged to get dissolved, soon after its establishment, when, after the War was terminated, the soda industry fell into a low ebb, and very poor soda crops lasted a few years, into the bargain. Thus, all plants had to be closed and dissolved.

Others in the direction of Tzusuant and Hagainzu, like those about Endontou, were laid out during and after the War.

At that time the Liaohsi Co. undertook to superintend the business under special contract with the Mongolian chieftain, operating a factory itself and looking over five or six soda factories financed by other capitalists.

It may be mentioned that the Liaohsi Co. was founded on a capital of about S.Y10,000 in Chinese small silver coins. At the start, a suitable profit was

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gained, but recently the Company, having been financially embarrassed because of their heavy investments and depression of soda business, was compelled at length to be dissolved.

Revival of Fishery & Soda Co. and Present Condition.

The soda factories at the soda fields on both banks of the West Liao got business all of a sudden on the outbreak of the War, but were pushed down to the depth of dullness after the close of the War.

Of course, this was mainly due to the stagnancy of the economic market, but at the same time, the inclement soda crops brought on for a few years running chiefly by the successive droughts had a great deal to do with it.

Since the end of 1919 the Liaotsa and Soda Industry Companies, which dominated between them the soda fields on the right bank of the Liao, have been dissolved, and in addition, all the soda factories numbering about twenty, excepting a few, have been shut down.

In 1920, the Fishery & Soda Co. relinquished its business and was practically dissolved.

Lately, the sharp decrease in the arrivals at the market and the abrupt fall of the market after the War have caused a reactionary improvement in point of price.

At Chengchiatun, lump soda was quoted at S.Y.7.50 per 100 blocks of lump soda and S.Y.2.40 per 100 *kin* of powder soda on an average in 1919.

The highest quotations in 1920 were S.Y.13 and S.Y.3.40 respectively.

The relatives of Marshal Chang Tso-lin have succeeded to the business of the Fishery & Soda Co. that has been discontinued, and by agreement with the Mongolian chieftain, the same concession has been taken over in an extended scope since the beginning of 1921. Not only the fields on the left bank of the Liao, but also the others on the right bank of the River, together with the management of the soda industry and the fishery concession for the Liao River, Lakes, etc., have been acquired.

The new Fishery & Soda Co. is also a joint stock company capitalized at about S.Y.100,000 in shares of S.Y.500 each.

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The principal officials were

Mr. Kao-wenching (of Tungliao Prefecture, Fengtien Prefecture), Manager;
Mr. Liu-shaokiang (of Fengtien), Assistant Manager;
Mr. Kuo-chenfeng (of Yingkou) and Mr. Wang-tienwu (of Liaoyang), Auditors.

Thus the Company took up the exploitation of soda fields and the management of the soda factories conjointly with the capitalists concerned.

The different soda plants founded in spring in 1921 have for their material such soda fields in the lowland like marshes and ponds as yield a good amount of soda.

They may be tabulated under, as they stood in spring, 1921:—

Chi factory,	Hoshinori in Polishan soda field,	founded about 1913.
Wang factory,	Almato "	Before Republican regime
Chou factory,	"	"
Wangyuhai factory,	in Nertohosho	about 1916
Wang factory,	in Tzusuant	"
Chou "	in "	"
Chou "	in Polohotokaya	"
Fu "	in Ta-Belebo	opened in 1921
Fu "	"	"
Fu "	in Hsiao-Belebo	"
Li "	"	"

Altogether there were about eleven or so of them.

In passing, the profit of the Fishery & Soda Company was distributed among the investors and staff at the undermentioned rates:—

The Company,	20%	of manufacture
Investors,	40 or 50%	"
Staff	40 or 50%	"

All expenses connected with the construction of a soda factory, the food expenses for all the workmen at work, and other items of up-keep expenses are borne by the investors. Among the workmen, the foremen receive the highest share; skilled workmen, older hands, raw hands, and minors receive their pays according to their efficiency.

III. Soda Fields.

a Polishan Soda Field.

First on left bank.

Polishan is situated at about 7½ miles northeast of Chengchiatun and is a small mound rising on the left bank of the new Liao River. It stands in the

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vast plain in the Liao Valley, and its sanitary elevation presents a fine sight. Especially, in spring and summer, the fresh verdure of the eminence is a scene feature not at all to be despised. The New Liao about this spot begins to turn from the north to south direction, assuming gradually a direction from northwest to southeast.

This mound is, as already stated, on the left bank of the new Liao, with its surrounding zone being made up of a very low damp plain. Here and there marshes are found, and except in winter when the rivers are ice-bound, this locality is simply impracticable.

Starting from Polishan, what is called the Polishan soda field lies for miles stretched northwestward. It has dozens of marshes, and when there is heavy rain, the Liao is liable to get flooded, forming a marsh land of broad area.

Even in the drier seasons of spring and autumn, the ground never gets quite dry, so where soda is produced is restricted.

The Fishery & Soda Co. finds it more lucrative to engage in fishery in these marshes than in soda gathering.

The actual soda zone on the left bank of the new Liao River does not in fact start from Polishan, but from some distance northwest of Polishan, extending for about forty miles or so westward. Soda factories have been opened from comparatively early times.

Therefore, Polishan soda field does not, strictly speaking, cover the actual soda zone, but in addition to the eminence of the fantastic shape, it is located near Chengchiatun, being, so to speak, at the gate of the soda fields on the left bank of the new Liao; moreover, all natural soda manufactures from the soda belt pass through this district, bound for Chengchiatun. All these have perhaps given rise to the erroneous impression that Polishan soda field is the centre of the soda zone.

Polishan Soda Field and Fishery & Soda Co.

The Fishery & Soda Co., Chengchiatun, rented from the Mongolian chieftain a narrow strip of land, 10 miles wide and about 50 miles in length, having on the northwest the place about Miliyintzu on the left bank of the Upper new Liao, from Polishan on the southeast, in the 2nd year of Hsuantung. The Company took up the gathering of natural soda and the catching of fish, on the payment to

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the Mongolian chieftain of Wentuerh S.¥2,000 per annum for the gathering of soda and S.¥4,000 for fishery.

Soda Fields.

As already stated, the marsh lands about the base of Polishan may be considered more as a fishing zone, the real soda field starting from near a Mongolian village of the name of Ganjuoh at about 17 miles northwest of Polishan and including a narrow strip of land extending northwestward to near Miliyintzu.

This region is part of a wide grass land on the left bank of the new River. Few trees or other plants grow thereon; neither do rivers flow into or out of it. In this zone, soda is produced almost everywhere. But, what is known as the soda field is divided into about a dozen tracts of grass land. In other words, a soda field is a low grass land about a mile or so in diameter. All around the zone, rise gently sloping hills, what faces the Liao being only what amounts to an undulation of a little more than ordinary height.

The soda fields being of much the same level as the Liao River, a heavy rainfall or a flood will readily cause an overflow to the soda field in part. Moreover, the rain water from the hilly land about it will get into the soda field, causing pools to form here and there. Especially in the rainy season in summer, the locality turns to an extensive swamp, although in the dry seasons in spring and autumn, the whole of the soda field gets practically dry, save for a few pools.

Few Mongolian villages are found in the level part of the soda field, but where the hills rise on the north or the west and soda fields lie on the south or the east, the Mongolians rear their huts. It is more to have shelter from the western or northern wind than to have sunshine.

The Mongolians cultivate the hilly land and have their live stock grazing on the soda field.

Houses are put up, according to Manchurian style, and the natives have adopted Manchurian ways.

How natural soda is generated at the soda field may be omitted, as it is much the same.

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Soda Factories.

The soda factories in the whole of Polishan soda fields (inclusive of those at present and in the past) are as follows:—

At beginning of 1921.

Soda factory	Capitalist	Soda field		When established	How it stands
Chou	The Chous of Chinchow	Almato	5 miles long 1 2 3 miles wide	about 1912	No soda gathered or manufactured last autumn or this year
Ruins of Chou	—	"	"	"	"
Wang	Wang of Chengchiatun	"	"	Before Republican regime	Soda gathered & manufactured this year
Chou	Chou of Chinchow	"	"	"	"
Li (2 plants)	Li of Chengchiatun	Hoshinan	3 miles long 1 2 3 miles wide	about 1914	None manufactured last year. Gathered & manufactured last spring
Wu	Wu of Chengchiatun	Shinnaini	"	"	None manufactured or gathered last year or this year
(Ruins of a plant)		Ilichi	"	—	—
Fuli	Fu of Chengchiatun	"	"	about 1915	None gathered or manufactured last year or this year
(Ruins of a plant)	—	"	"	—	—

Remarks The names of soda fields are identical with those of the villages where they are situated

These soda factories are the producers of what is termed "Chengchiatun" soda, and the newest even are at least seven or eight years old.

They are the nearest to Chengchiatun. Formerly the natives gathered the soda earth and carried it out to Chengchiatun to have it refined there into powder soda. The total outputs have never yet gone over 1,000,000 *kin* a year.

However, as the cartage for soda earth became dearer, and as the Fishery & Soda Company was founded in the 2nd year of Hsuantung (1910), the same Company was granted the concession to gather natural soda by the Mongolian chieftain. The soda factories at Chengchiatun have mostly been shifted to the soda centre, and those factories above mentioned have been established under agreement with the Fishery & Soda Co

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Since soda rose gradually in price, and since the outbreak of the War, its outputs increased suddenly.

The following table gives the outputs and prices of both powder and lump soda from 1915 to 1917:—

Outputs and prices of soda products of Polishan Soda Field During the War.

	1915	1916	1917
Powder soda	4,000 boxes	13,000 boxes	17,000 boxes
	720,000 *kin*	2,340,000 *kin*	2,060,000 *kin*
Lump soda...	400,000 pieces	500,000 pieces	300,000 pieces
	2,200,000 *kin*	2,750,000 *kin*	1,600,000 *kin*
Price			
At Polishan			
Powder (100 *kin*)	S.Y 2.4	S.Y 2.9	S.Y 5.6
Lump (100 pieces)	7.5	10.5	13.5
At Chengchiatun			
Powder (100 *kin*)	S.Y 2.8	S.Y 3.3	S.Y 6.0
Lump (100 pieces)	10.0	13.0	16.0

As indicated above, the divergence between the prices at Polishan and Chengchiatun is due to the cartage. The distance between the two places is about 53-57 miles (47 miles to Almato) (the nearest spot) and 62 miles to Ilichi (the farthest point), which may be covered by carts in one or two days. The cartage averages S.Y2.2 per 100 pieces lump soda and S.Yo.75 per box powder soda. (An ordinary cartload is 300 pieces lump soda, weighing about 1,600 *kin*, the cartage being S.Y6.60; as to powder soda, 2,800 *kin* may be loaded on a cart at the rate of about S.Y6.00.)

Lump soda is mainly carted away in early autumn, while the transportation of powder soda is carried on in winter while the ground and the rivers, etc., are ice-bound.

To cite cartages from the soda field to Chengchiatun about 1919, the rates for lump soda per 100 pieces weighing 500 *kin* were S.Y1.40 from Chou and Wang factories at Almato, and S.Y2.50 from Fu factory at Ilichi; whilst, as to powder soda per box weighing 180 *kin*, the cartage rates were S.Yo.60 and S.Yo.80 respectively.

Since the restoration of peace in 1919, the market has fallen Slightly, and the majority of the factories have been closed.

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As already hinted, the soda crop turned out very poor in 1920, and although a few plants at Almato operated, the crop condition proved worse in the succeeding autumn, and all the plants were closed, with the sole exception of the Chou factory which professed to manufacture power soda in winter of the surplus soda earth gathered in spring.

In spring, 1921, the soda crop came out a little more favourable and the Chi factory at Hoshinon and both Chi and Wang factories at Almato kept working, and preparations were under weigh to take up the manufacture of lump soda, but nowhere else gathering or manufacture of soda was undertaken.

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TRADE & INDUSTRY.

MANCHURIAN WHEAT.

Its Possibilities.

Manchurian wheat has drawn wide attention because of its heavy shipments to Europe in 1920 and 1921.

The South Manchuria Railway Company inaugurated the Mixed Storage of Wheat in a hurry, and an impression seems to have taken hold of the exporters in general that wheat ranks next to Beans only as export cereals.

How far is the above mentioned impression correct?

Of late, investigation has been started in various quarters, and, according to one of such returns, the total annual outputs of wheat in Manchuria range between 9,000,000 *koku* (or 1,500,000 tons) and 12,000,000 *koku*.

The above figures appear to be at wide variance, when viewed from the dual standpoint of consumption and distribution.

While how these investigations were conducted is unknown, it seems probable that these same figures have been obtained mainly from the total area of cultivation and the average harvests.

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Still, in Manchuria, this total area of cultivation is next to impossible to ascertain.

It may be stated that the Chinese, both in government service and in business, have only a limited notion of statistics, and on this account, nothing like accurate data are obtainable. Therefore, the indicators of consumption, such as material for flour milling and the export statistics, may be regarded as a more reliable basis than the investigation of the wheat fields, which are scattered over a vast territory.

From this point of view, the total amount of wheat placed on the markets along the South Manchuria and the Chinese Eastern Railways is estimated at about 3,000,000 *koku* a year when the crops have turned out average. (How these figures have been prepared is not given).

In addition, what is used as seed-wheat and what is for the home mills may be estimated approximately to be 20% of the total outputs, making the grand total of production something like ¥3,800,000 *koku*.

Now, the flour mills in North and South Manchuria are capable of consuming as material from 2,800,000 to 3,000,000 *koku* of wheat a year at a conservative calculation.

In case of all these mills putting forth the utmost of their producing capacities, there will be very little left for export abroad.

Thus, what may be available for export will be determined by the wheat amount used by all these mills.

Let us now see the export amounts from 1912 to 1919. The average annual amount is only 13,360 tons.

On the other hand, when wheat flour imported from Shanghai and the United States during the same period is converted into wheat itself, the annual average comes up to 87,550 tons, or it means the excess of imports over exports by over 74,000 tons.

The above fact shows that, while Manchuria still remains a consumer of wheat flour or wheat, it is by no means an exporter.

Then the question arises: "How came it that so large quantities of wheat could be exported to Europe and Japan in 1920 and 1921?

The explanation that comes handy is that, in the three years—1918, 1919, and 1920—North Manchuria was favoured with bumper crops of wheat, whilst the

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Chinese Eastern Railway, which then made up the only means of transportation, was deprived of practically all carrying power, and this had caused the wheat stocks to get congested, lowering the price abnormally.

On the termination of the War, the Chinese Eastern Railway had its traffic conditions restored, and this presented a capital opportunity for the congested wheat stocks to find their way into Europe.

At that time, the War Time Food Restriction Act was still in force in Europe; whilst, in the United States, the Government fixed the minimum price of wheat in order to check its gradual drop, whilst the war time price was retained only with a slight variation. Thus, the cheap-priced wheat was made into an article of general interest.

In short, the exports to Europe might be construed as an economic abnormality created as an effect of the prolonged War.

Such being the case, Manchuria holds out no promise of developing in the future as a wheat exporter for Europe like the United States, Canada, Australia, etc.

Even for Japan, in view of Canadian wheat, possessed of high glutinous property, which is much alike to American wheat, being importable on moderate terms, no export of Manchurian wheat to Japan in any considerable quantity can be looked for.

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MANCHURIA ENLIGHTENING SOCIETY.

Whose Organ the "Light of Manchuria" is

What actuates us in our endeavours to open up Manchuria and Mongolia lies in realizing our ultimate ideal in the enlightenment and development of Manchuria and Mongolia. It will not do only to develop the natural and industrial resources, but the ethical and intellectual culture of the inhabitants must also be carefully husbanded and nourished, so that both mind and matter may be developed in harmony.

The Manchuria Enlightening Society raised its first cry in order to fill a sorely felt need. Its primary mission is to investigate and propagate the truths of the development of Manchuria and Mongolia. We shall studiously refrain from misleading the public by disseminating inaccurate or exaggerated reports, but shall steadfastly adhere to the truth or facts only.

It is urgently important that the truths regarding Manchuria and Mongolia should be made known clearly not only to Japan and China, but also to Europe and America. On this account, the establishment of the Manchuria Enlightening Society is bound to have a serious significance of international character.

If happily, through the establishment and activity of this Society, the truths of the development of Manchuria and Mongolia should become topics of world wide interest, it would not be only an honour to those now actively engaged in developing these regions, but also a matter of congratulation to the world at argle.

We might be permitted to add that the ultimate ideal and desire of this Society are to serve as the herald of all enlightening movements in future, thereby opening a new chapter in the annals of the world's civilization.

What is the Society Like.

a) Office.—The office of the Society is in the Municipal Office Building on Central Circle in the city of Dairen.

(b Society's Work.—The works of the Society include the following :—

1. Publication of the organ of the Society, The "Light of Manchuria."

2. Supply of general information through the Society and by other means, giving the results of such investigations and researches as may be conducted in the interest of the development of natural, industrial, and other resources in Manchuria, Mongolia, and Eastern Siberia.

3. To act as guide to intending investors in general in all kinds of enterprises in Manchuria, etc., and also to undertake any special investigation or research on application by promoters of all kinds.

4. To offer facility to travellers on inspecting visits to Manchuria, Mongolia, Siberia, Chosen (Korea), China, etc., to the end of imparting accurate information and rendering their observations as close to truth as possible.

5. To use all kinds of means in order to propagate the true conditions obtaining in Manchuria, etc., and further to carry on the propaganda work for these regions through the medium of lecture meetings, exhibitions, etc.

6. To compile, publish, sell and distribute books, pamphlets, etc., bearing on Manchuria and Eastern Siberia.

7. To carry on other works necessary for disseminating information on Manchuria, etc., and also for fostering economic enterprises therein.

c) In carrying on the above work, the Society is divided into the following :—

Secretariate,
Research Department,
Publication Department,
Intelligence Department, and
Accounting Department.

d) Any one wishing to join the Society is requested to send in a written application, giving the name and address, accompanied with the

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membership fee for not less than three months paid in advance.

c The membership fee, entitling the member to a copy of the monthly organ, costs 90 sen (¥ per month and ¥ per annum.

Remittances.

All remittances to the Society may be made most conveniently and safely to Transfer Savings No. 2890, Dairen. No receipts for the same will be issued, but instead the Society's monthly organ will be sent.

Officials.

Baron S. Goto (Mayor of Tokyo), President.

Mr. S. Hayakawa (President, South Manchuria Railway Company), Chairman;

Mr. Y. Aoki (Chairman, Chamber of Commerce, Dairen), Vice-Chairman;

Mr. Y. Matsuoka (Director, South Manchuria Railway Company), Vice-Chairman;

Mr. H. Kinahara, Secretary.

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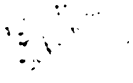

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